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Ohio Agricultural Experiment Station

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TECHNICAL SERIES.—VOLUME I, NUMBER I.

OCTOBER, 1889.

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ARTICLE II.—STUDIES IN POND LIFE.

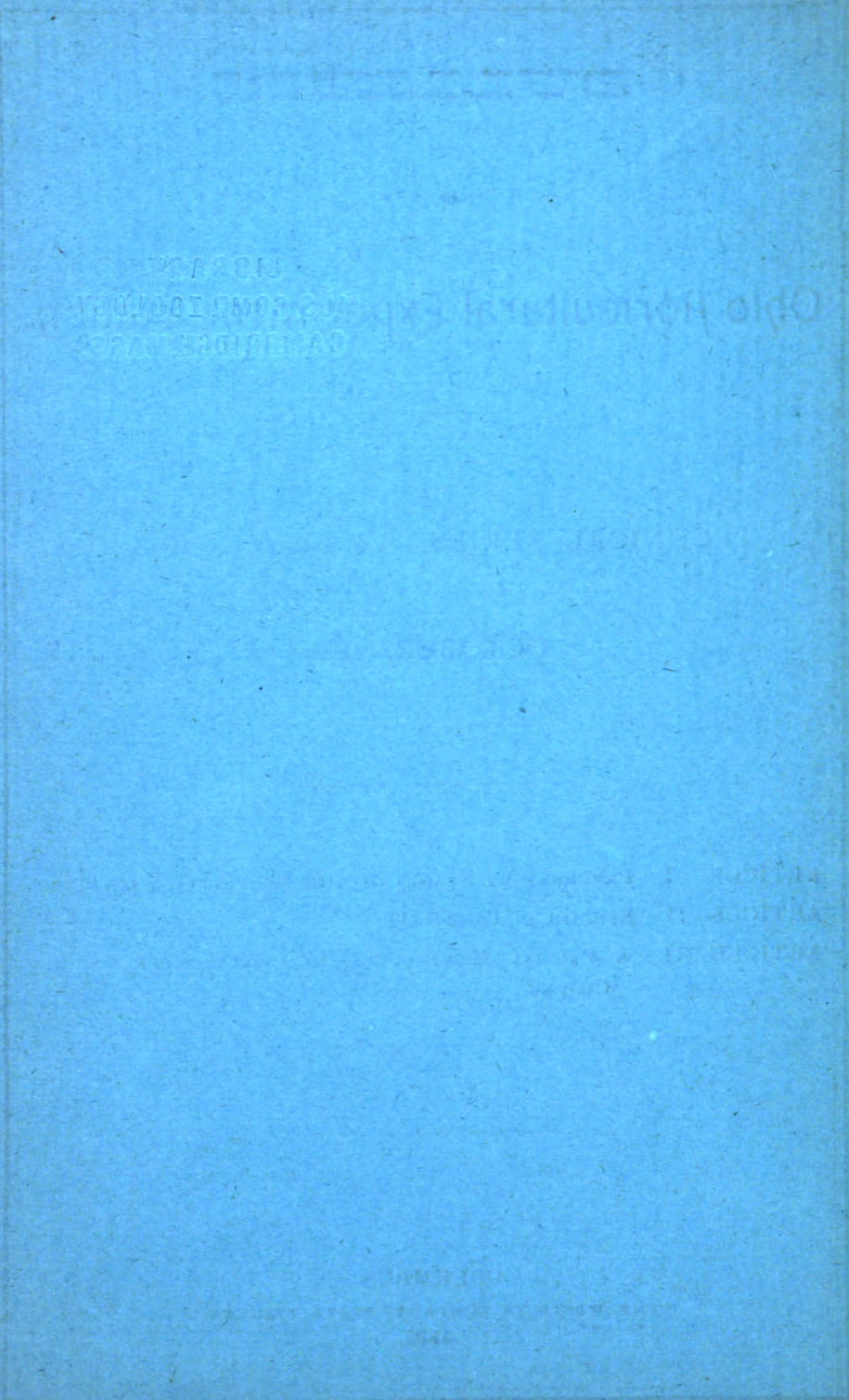
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Offices and Experiment Grounds on the Farm of the Ohio State University.

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 This series of the Bulletin of the Ohio Agricultural Station is intended to embody the technical results of the work of the Station. It is not expected that these results will be of direct service to farmers in general, but it is hoped that they may be found useful by workers in other stations and thus indirectly serve the cause of agriculture.

BULLETIN

OF THE

OHIO AGRICULTURAL EXPERIMENT STATION.

VOL. I, No. 1.

TECHNICAL SERIES.

OCTOBER, 1889.

ARTICLE I.—ON THE PREPARATORY STAGES OF THE 20-SPOTTED LADY-BIRD (*Psyllobora 20-maculata*, Say).

BY CLARENCE M. WEED.

[Plate I, Fig. 1.]

About the middle of September, the present season, I found the larvæ and pupæ of this handsome little lady-bird, abundant on the leaves of various composite plants in the Olentangy bottoms on the Station farm. They were found especially on false or blue lettuce (*Mulgedium floridana*, and *M. acuminata*), iron-weed (*Vernonia*), and various kinds of false sunflower (*Helenium*). The larvæ generally occurred on the under leaf surface, to which also the motionless pupæ were attached. Most of the plants upon which the insects were found were infested by plant lice (*Siphonophora rudbeckiae*) from which I surmised that the Coccinellids might be feeding upon them, although no observations to that effect were made, and it is perhaps more probable that they subsist upon fungus spores, or smaller insects than these plant lice. At the time they were first seen (September 19) a few adult beetles were present, but most of the specimens were in the larva or pupa state—the latter apparently being more numerous than the former.

The length of pupal life is about a fortnight, a larva under observation in a breeding cage having attached itself for pupation September 26, pupating a day or two afterwards, and emerging as an adult October 9.

It frequently happened that both the larvæ and adult beetles were caught and killed by the mucilaginous exudations of the involucre of the blue lettuce plants which they inhabited.

I found none of the unhatched eggs, but egg shells, doubtless belonging to this species, were not uncommon on the leaves, occurring in clus-

ters of from four or five to seven or eight. They were elongate oval in form, and about one mm. in length; and were probably whitish before hatching.

The adult beetle is shown at Fig. 1, c, Plate I. It is a small, whitish hemispherical insect, with numerous black spots upon its back.

DESCRIPTION.

The larva and pupa may be described as follows:

LARVA.—Plate I, Fig. 1, a. Length 4 mm.; width 1.2 mm. Body with many tubercles arranged in rows and with rather long spinose hairs. White: mouth parts reddish brown; eyes and spot just above dusky; two large dusky spots on dorsum of prothorax; a pair of similar spots each side the dorso-median line on each of two following segments, with another spot near the outer margin; only two spots on the first abdominal segment, but four on each of the following except the last three; two on the second and third from the last. Tarsi more or less dusky.

Described from many specimens.

PUPA.—Plate I, Fig 1, b. Length 2.2 mm; width 1.6 mm. Shape broadly ovate. General color whitish; eyes brown, blackish in older specimens; a row of black spots running on each side of dorso-median line from the thorax to the next to the last abdominal segment, broadening into a band along middle of abdomen, with one or two dark spots on the middle segments between the band and the side margin.

In older pupæ the eyes and wing covers are dusky and the spots of the beetle show distinctly.

Described from many living specimens.

ARTICLE II. STUDIES IN POND LIFE. I.

BY CLARENCE M. WEED.

One of the richest fields awaiting investigation by the naturalist is that of the transformations, habits and mutual relations of the myriad forms of aquatic life with which our inland lakes, rivers and ponds are teeming. Numberless problems, of great scientific as well as economic interest, lie wrapped in

“The green mantle of the standing pool,”

or beneath the rippling surface of every babbling brook.

There is on the Station farm, in the bottoms of the Olentangy river, a series of ponds fed by springs, and seldom completely drying out, which are exceedingly rich in aquatic life, both animal and vegetable, including within their borders nearly all forms found in fresh water ponds in the central United States; and it seemed that the opportunity for careful and con-

tinuous study of the habits and mutual interactions of these various organisms ought not to be neglected. Accordingly the subject has been taken up, such odd moments being given to it as the pressure of other duties would permit, and the present article contains a few of the results obtained.

1. ON THE LIFE-HISTORY OF THE LARGER TYPHA-BORER (*Arzama obliquata*, G. & R.)

[Plate I, Fig. 2.]

One of the most interesting aquatic lepidopterous larvæ is the species above named, which bores the stems of the Cat-tail Flag (*Typha latifolia*). It is abundant in the ponds of the Olentangy bottoms, a large proportion of the Typha stems showing evidence of its work. I call it the Larger Typha Borer to distinguish it from another lepidopterous larva (*Nonagria oblonga*) having similar habits, which may be called the Smaller Typha Borer.

This insect was first described in 1868 by Grote and Robinson, who apparently were not acquainted with the larva,* and the first published account of its life-history appeared in 1883 in the report of a discussion between Drs. Riley and Kellicott at a meeting of the Entomological Club of the American Association for the Advancement of Science.† The aquatic habits of the insect are there described and the conclusion is reached that it is single brooded north and double brooded south. Nothing further of importance concerning the insect appeared until 1888, when an animated discussion took place‡ between Messrs. Kellicott, Brehme, Moffat and Johnston concerning the place of hibernation of the larva, some contending that it remains in the Typha stalks through the winter, pupating in them in the spring, and others that it leaves the stalks in autumn and hibernates in logs and similar situations on shore, pupating there in spring. The observations reported showed that both sides must be correct, and that both situations are sometimes chosen for hibernation.

OBSERVATIONS.

My observations on the species began April 4, 1889, when two larvæ were taken from a log lying on the shore of one of the Olentangy ponds. The under side of the log was in the water, but the larvæ were under the bark of the upper side, considerably above the water level. One of the larvæ was placed in a breeding cage. It pupated April 10, and emerged as a moth May 7.

*Trans. Amer. Entomological Society, v. I, p. 339.

†Canadian Entomologist, v. XV, pp. 171, 174.

‡Ibid., v. XX, pp. 119, 139, 238; v. XXI, pp. 39, 78, 79, 99.

A pupa of the insect was next found in a rough cell beneath the bark of a log in a situation similar to the one above mentioned. Placed in a breeding cage, in an unheated room, it emerged as a female moth May 10.

One of the larger ponds was next visited April 13, and a great number of *Typha* stalks were examined. The first stalk cut open, which was in the water some distance from shore, contained a dead *Arzama* pupa. Another stalk contained a living larva surrounded with evidence of recent feeding, and in another a larva which had become shortened preparatory to pupation was found. In the course of the search, which was continued for nearly two hours, a half dozen more larvæ were found in the stalks, some of them being shortened for pupation and the others active and feeding.

Four of these larvæ were put in a breeding cage. Three days later (April 16) part of them had become pupæ, and when the cage was next examined, April 23, all had pupated. One pupa was removed, the others being left in the cage, and May 11 a fine pair of moths had emerged. The day following the third pupa transformed.

No further observations were made upon the species until October 14, when a large number of larvæ, mostly full grown, but some not over two-thirds grown, were found in the *Typha* stalks.

The larva, shown somewhat enlarged at Plate I, Fig. 2, *a*, is a rather handsome insect, and swims readily by an undulating, snake-like movement of its body. It is especially interesting on account of the peculiar position of two of the spiracles which are placed on the caudal margin of the eleventh segment. The antennæ are also peculiar, as will be seen from Fig. 2, *b*, Plate I, where one of them is represented highly magnified.

The general form of the pupa is shown at Plate I, Fig. 2, *c*. It is reddish brown in color, and is about 30 mm. long.

The moth is a rather handsome, brownish insect, with an oblique dark band across each front wing. It is represented, natural size, at Plate I, Fig. 2, *d*.

DESCRIPTION.

The larva and pupa of this species may be described as follows:

LARVA.—Plate I, Fig. 2, *a*, *b*. Length, 40 mm.; transverse diameter, 11 mm.; vertical diameter, 6 mm. Subcylindrical, slightly flattened transversely. General color, grayish; head, antennæ, cervical shield and true legs brownish. Head smooth, shining, having a very few brown hairs; five ocelli arranged in a semi-circle on each side, just back of antennæ, and a sixth one just below each antenna. Antennæ three-jointed; basal joint inconspicuous; second joint long and thick, surmounted on its outer distal angle by a long slender hair; third joint small, spherical, situated on the concave tip of second. Skin finely rugose. Dorsum of first segment behind head bearing cervical shield; of 2d, bearing three deep oblique impressions; of 3d, bearing two similar oblique impressions; of

4th, bearing a deep transverse impression slightly back of the middle, with a faint indication of an oblique impression just in front of it; of 5th to 10th, bearing a similar transverse impression slightly back of middle; of 11th, bearing a short longitudinal impression on each side of median line, beginning at anterior border and running two-thirds distance to posterior border, and also having a similar longitudinal impression on each side lower down. Segment 12 very short, less than one-fourth length of 11; its dorsal surface depressed considerably below dorsal surface of 11, to make room for the spiracles on the posterior margin of 11. Dorsum of segment 13 forming cauda, semi-circular, smooth. Spiracles situated vertically on side of segments 1, 4, 5, 6, 7, 8, 9, 10, and nearly horizontally on the posterior margin of 11, above dorsum of 12. Prolegs on ventral surface of segments 6, 7, 8, 9; skin between each pair with oblique impressions in the shape of a V.

Described from several specimens.

PUPA.—Plate I, Fig. 2, c. Length 3 mm. Reddish brown, head and thorax dark brown. Of normal shape, with a large, blunt, tubercle-like projection at caudal end, the surface of which is deeply reticulate.

Described from one bred specimen.

2. ON THE LIFE-HISTORY OF THE TOOTHED-HORNED FISH-FLY. (*Chauliodes rastricornis*, Ramb.)

[Plate I, Fig. 3.]

The insects belonging to the Neuropterous genus *Chauliodes* have received comparatively little attention in this country, no important addition to our knowledge of them having been made since the publication of Hagen's Synopsis of the Neuroptera of North America, and the observations recorded by Walsh in the second volume of the Proceedings of the Entomological Society of Philadelphia. The species named above, which was discussed by Walsh, is the only one whose immature stages have been described, and the transformations of this are only partially known.

Although in the present article I can add but little to the account given by Walsh, it seems worth while to record my observations, and to illustrate the insect in its several stages. Moreover, my description of the imago is, I believe, the first one in which both sexes have been described at length. I am indebted to the kindness of Dr. H. A. Hagen for the verification of my determination of the species.

OBSERVATIONS.

The first larva noticed in 1889 was found early in spring in a lot of material from the bottom of a small lake on the University grounds. It was placed in an aquarium, where it lived for some time. A few days later another larva was taken in the same situation.

The larvæ were next taken April 4th, under the bark of logs lying in the water of one of the Olentangy ponds. They were above the water

level in rude cells which had been gnawed out of the soft bark and wood. Part were put in alcohol, and the three remaining placed in a breeding cage containing partially decayed wood. When the cage was next examined April 22, the larvæ had pupated. One pupa was put in alcohol. A fine male imago emerged April 30, and another of the same sex appeared May 6.

Two larvæ were next found under the bark of a log in a similar situation April 10. One was preserved in alcohol and the other placed in a breeding cage. It emerged as a female imago April 24.

Again, May 4, a larva and pupa were found under the bark of a log. Each had made a rough cell. They were placed in a breeding cage, and three days later (May 7) the larva had pupated. A male *Chauliodes* emerged May 10, and the other, also a male, followed May 13. In this case the pupa state could not have lasted longer than eight days.

Two nearly full grown larvæ were next taken early in October, from material from the bottom of one of the Olentangy ponds. They were placed in an aquarium, and their habits studied for some time. Their ordinary mode of locomotion is by crawling along weeds, and the debris of various kinds which gathers at the bottom of ponds, but when alarmed they can swim rapidly by suddenly doubling the body up, bringing the head in contact with the abdomen, by which means they are propelled some distance through the water. They evidently live upon various animals, as I have seen them feeding on dead Back-swimmers (*Notonecta undulata*), flies which had fallen into the aquarium, and in one case a spider which I had thrown in. When a *Notonecta* or *Zaitha* would come near the *Chauliodes* larva while feeding, the latter would snap viciously at it with its powerful jaws.

I surmise that these larvæ have some protection from the attacks of *Zaitha fluminea* and similar predatory creatures, for, although it would seem that the *Zaitha* with its powerful beak could easily kill them, I have never known it to be done. When handled, the *Chauliodes* larvæ occasionally eject from the mouth a considerable quantity of a blackish fluid, reminding one of the similar habit of certain locusts (*Acrididæ*).

These *Chauliodes* larvæ also have a peculiar habit of walking on the surface of the water, body downward. They can move along in this manner quite rapidly.

DESCRIPTION.

The various forms of this insect may be described as follows:

LARVA.—Plate I, Fig. 3, a. Length from head to tip of abdominal appendages 40–50 mm. General color, dingy brown; head piceous; legs, antennæ and dorsum of thoracic segments lighter brown than abdomen. Head sub-quadrated, shining, with scattered

punctures. Antennæ 5-jointed; each joint more slender than the one preceeding; joint I, short, large; II twice as long as I; III longest, three times length of II; IV very short, about equal to I in length; V long, pointed, slightly shorter than III. Ocelli lateral just caudad of antennæ, six in number, four being more distinct than the other two. Dorsum of first thoracic segment entirely chitinous, shining, smooth, except for scattered shallow punctures; color brown mottled with black, and having a longitudinal dark stripe on median line, and a transverse impression slightly in front of posterior border, running into the base of a marginal disc on each side. Dorsum of second thoracic segment chitinous, not more than half as wide as first, each with a faint transverse impression near its anterior border, and another near the posterior border, the latter running obliquely forward on each side until it meets the former. Ten abdominal segments: segment I half as long as II, but segments II to VIII subequal; segments I to VIII each having "a lateral, subterminal, exarticulate seta nearly at right angles to the body, and about as long as the body is wide," (Walsh) immediately above and slightly in front of which on segments I to VII are the spiracles, which are wanting on the sides of segment VIII. Dorsum of segment I having an indistinct transverse impression near its cephalic border, behind which are two transverse oblique impressions; dorsums of segments II to VIII each having a distinct transverse impression near cephalic border, caudad of which are two other similar but less distinct impressions. Terga of abdominal segments having also more or less distinct longitudinal oblique impressions. Tergum of segment VIII having a pair of fleshy, exarticulate, contractile filaments 5 mm. long, extending caudad from its caudal surface on the tips of which are the spiracles of segment VIII. Segment IX (which according to Walsh's description is a "fleshy pillar" extending caudad from segment VIII) short, cylindrical; segment X with pair of fleshy prolegs, armed with two strong, shining, curved claws; each proleg having also on its dorso-lateral surface a fleshy tapering seta extending beyond the claws. Tarsi of thoracic legs, one-jointed, with two terminal claws.

Described from two specimens.

PUPA.—Female. Plate I, Fig. 3, b. Length when extended 38 mm. Normally partially curved as shown in figure. Dingy brown, head darker. Antennæ curved over the eyes. Tarsi five-jointed, with two claws. Wing pads prominent. Eight abdominal segments. At tip of abdomen are "two robust abdominal appendages, confluent towards their base, and about 2 mm. long, and an inferior process of two similar ones which are connate throughout." (Walsh).

Described from one reared specimen.

IMAGO.—Male. Plate I, Fig. 3, c. Length from head to tip of wings 38 mm.; wing expanse 63 mm. General color luteo-cinereous; eyes, antennæ, mandibles, except tips, quadrangular space between ocelli, two oblique stripes united at upper portion ventro-caudad of eyes, a large oblique blotch dorso-caudad of eyes, four small and one large spots in a transverse series on occiput between blotch last mentioned and median line, an indistinct irregular longitudinal line along prothorax each side of median line, and another along margins, tarsi and more or less of femora and tibiæ, base of wings, part of dorsal and ventral surface of meso and metathorax, more or less of abdomen, and spots on the veins of the wings, fuscous. Anterior wings subcinereous; veins yellowish white interrupted with black. Antennæ 13 mm. long; multiarticulate, pectinate on inner surface, and densely clothed with fine hairs. Eyes prominent. Ocelli three, arranged in a triangle, one looking cephalad, and the other two caudo-laterad.

Described from three bred specimens.

IMAGO.—Female. Plate I, Fig. 3, d. Length, head to tip of wings 50 mm. Wing expanse 80 mm. Besides its larger size, it differs from the male in having serrate antennæ.

Described from one specimen bred in Ohio and two collected in Michigan.

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Original description.

1853. WALKER, F. *Chauliodes rastricornis*. Cat. Neurop. British Museum, Pt. II, p. 198.

Description.

1861. HAGEN, H. *Chauliodes rastricornis*. Synop. Neuropt. North Amer., pp. 189-190.

Description of female. Habitat given as "Savanna; South Carolina (Zimmerman)."

1864. HAGEN, H. *Chauliodes rastricornis*. Proc. Ent. Soc. Phila., v. II, p. 181.

Notes receipt of both sexes from Walsh. Had before received a female from Illinois, through Uhler.

1864. WALSH, BENJ. D. *Chauliodes rastricornis*. Proc. Ent. Soc. Phila., v. II, pp. 263-265.

Larva described. Said to occur under the loose bark of floating logs, apparently beneath the surface of the water. Retires under logs, etc., on dry land to assume the pupa state, for which it forms a rude cell. Pupæ described. First imago appeared May 28.

1868. WALSH & RILEY. *Chauliodes rastricornis* Am. Ent., v. I, pp. 51, 80.

[Not seen.]

1869. PACKARD, A. S. *Chauliodes rastricornis*. Guide to Study of Insects, p. 606.

Mention of Walsh's observations on the larvæ.

1884. PACKARD, A. S. *Chauliodes rastricornis*. Standard Natural History, v. II, p. 156.

Larvæ said to be "like the hellgrammite, but considerably smaller, and with no caudal filaments; while the last pair of spiracles is on the tips of a pair of contractile filaments."

3. ON THE LIFE-HISTORY OF THE SAGITTARIA CURCULIO. (*Listronotus latiusculus*, Boh.)

[Plate II, Fig. 1.]

About the middle of September I found that a large proportion of the leaf and flower stalks, as well as the receptacles of the seed-heads of the common Arrow Leaf (*Sagittaria variabilis*), had been bored out by a Rhyncophorous larva which was then present in great numbers. A careful examination of many of the infested stalks and seed-heads was made September 19. The receptacles, so far as found, contained only larvæ and pupæ—the former occurring especially in the younger, greener heads, and the latter in the older, drier ones. In the stalks, however, all three stages were found—larvæ, pupæ and imagos—the latter proving to be a curculionid, which was subsequently identified by Professor S. A. Forbes as *Listronotus latiusculus*, Boh.

Many of the infested seed-heads were placed in breeding cages. The pupæ began emerging as beetles September 23, proving to be the same species that inhabited the stalks, and the beetles continued to appear until

the middle of October. A number of the *Sagittaria* stalks were also put in breeding cages, and a great many beetles, like those already found in them, emerged during the following fortnight.

The injury to the seed-heads is mainly confined to the receptacle, although many of the seeds are also more or less eaten. Frequently five or six larvæ or pupæ were present in a single receptacle.

In the infested stalks the larvæ and pupæ were very numerous, and in many cases had eaten all of the inner portion, leaving only the outer skin. Such stalks of course were brown and dead.

The length of the pupa state, as determined by two larvæ reared in breeding cages, is eleven days.

The various stages of the insect are shown, considerably magnified at Fig. 1, Plate 2—*a* representing the larva, *b* and *c* the pupa (*b* being a dorsal and *c* a ventral view) and *d* the adult beetle, which is brownish and about a quarter of an inch long.

DESCRIPTION.

The larva and pupa of the *Sagittaria Curculio* may be described as follows :

LARVA.—Plate II, Fig. 1, *a*. Length, 6 mm ; width, 2 mm. A footless, whitish grub with the head brown and the body furnished with sparse, brown, recurved hairs. Segments transversely wrinkled especially, on dorsum of abdomen.

Described from many specimens taken in receptacles and leaf and flower stalks of *Sagittaria variabilis*, September, 1889.

PUPA.—Plate I, Fig. 1, *b*, *c*. Length, 5 mm ; width, 3 mm. White: eyes brown in young specimens, becoming black as time of transformation to beetle approaches. Of normal curculionid form. Body sparsely covered with elongate, spinose, brown hairs. A convex tubercle, terminating in a brown spinose hair on each caudo-lateral angle of the last abdominal segment.

Described from many specimens taken in seed-heads *Sagittaria variabilis*, September, 1889.

4. ON THE FEEDING-HABITS OF THE LESSER WATER BUG (*Zethenia fluminea*, Say.)

[Plate II, Fig. 2.]

It is well known that this interesting insect is predacious, devouring a variety of animal organisms found in its environment, but records of precise observations on its feeding habits are very scarce. We obtained these bugs in considerable numbers from one or two of the Olentangy ponds, and kept many of them alive in aquariums, together with large numbers of other species from the same situation, so that an excellent opportunity was afforded for studying their habits in this respect.

Probably the most important element of food, as revealed in our aquariums, consisted of the larvæ and nymphs of Dragon-flies (*Libellu-*

lidæ.) These were captured continually and greedily devoured. Two or three *Zaithas* would exterminate all but the very largest of these in an aquarium in a short time.

The next most abundant victim was the common Undulating Back-swimmer (*Notonecta undulata*) shown at Plate II, Fig. 3. In one aquarium in which a large amount of pond material, including half a dozen *Zaithas*, had been placed, four were in sight at one time, each with one of these back-swimmers grasped in its front legs, and its beak inserted in the body. Similar observations were made a great many other times.

Univalve snails also occasionally contribute to the diet of this insatiable creature, as one was observed feeding upon a small snail with a spiral shell. May-fly larvæ (*Ephemeridæ*) also form part of its food, as was shown by similar observations.

Various terrestrial insects which fall upon the water are probably also devoured, as the bugs were frequently seen feeding upon flies and wasps thrown in the aquarium.

5. ON THE FEEDING HABITS OF THE UNDULATING BACK-SWIMMER (*Notonecta undulata*, Say).

[Plate II, Fig. 4.]

The predaceous habits of this insect have frequently been alluded to in entomological literature, and the purpose of the present note is merely to record some of the more important elements of its food in our ponds, as determined by observations made in newly-stocked aquariums.

Perhaps the insects most frequently captured by it were May-fly larvæ (*Ephemeridæ*), which were always greedily devoured when opportunity offered. A small species of Water Boatman (*Corisa alternata*) also suffered severely from its deadly assaults, and even good sized Dragon-fly larvæ were occasionally seized.

I think these insects have the power of ejecting a poison into their victims, as on two occasions I have had their beaks inserted into the skin between my fingers, and the pain produced was very much like that of a bee-sting—being much more severe than would be caused by the mere puncturing of so fine a point.

6. AN AQUATIC LEAF-BEETLE (*Donacia subtilis*, Kunze).

[Plate II, Fig. 3.]

Last July I found this species exceedingly abundant on various water plants at Pine Lake, in Ingham county, Michigan. It seemed especially to prefer the common Yellow Pond Lily (*Nuphar advena*), upon the leaves

and petals of which it was feeding in great numbers, a dozen sometimes occurring in a single blossom.

On returning to Columbus I found the same insect almost equally abundant on aquatic plants in the Olentangy ponds—here seeming to prefer, in the absence of Water Lilies, the common Burr Reed (*Sparganium ramosum*) the parenchyma of which it ate with avidity.

This species evidently plays an important role in effecting the pollenization of *Nuphar advena*, as the specimens in the blossoms were almost invariably thickly dusted with the yellow pollen from the stamens. It is interesting to note that Müller has found that a congeneric species in Europe (*Donacia dentata*) aids in the pollenization of the European representative of our Yellow Pond Lily—*Nuphar luteum*.*

This beetle also forms an important element in the food of the Bull-frog (*Rana catesbyiana*), it occurring frequently and often abundantly in the stomachs of specimens collected at Pine Lake, in July.

7. AN AQUATIC LADYBIRD (*Hippodamia 13-punctata*, DeG.)

[Plate II, Fig. 5.]

While collecting insects in the Olentangy ponds, September 24, I found this Ladybird very abundant in the pupa and imago states on the leaves of various water plants, the adults apparently feeding on certain plant-lice, which were numerous in the same situation. Two larvæ were also seen.

On referring to our collections made during the last two seasons, I found that although there were a great number of most of the other indigenous Ladybirds, there was but one of the present species, and that had been taken last July, on water-plants, in Pine Lake, Michigan, where, as I remember, this species was rather abundant.

I afterwards collected the beetles and pupæ repeatedly in the Olentangy ponds, the latter being attached to the leaves of a variety of water-plants. No larvæ was seen after September 24.

LITERATURE.

I have been able to find no reference to the aquatic habits of this insect in American literature, any mention of the species being infrequent as compared with most of the other members of the family. Among the more important references are the following:

In his First Report as State Entomologist of Missouri, Dr. Riley men-

*Fertilization of Flowers, Thompson's Translation, p. 98

tions this species as third in importance of the four Ladybirds that prey upon the Colorado Potato Beetle.

In the third volume of the Canadian Entomologist (p. 13) Mr. Wm. Saunders states that this species preys upon the Cherry Plant-louse (*Myzus cerasi*).

In the Sixth Report of the State Entomologist of Illinois, Dr. Thomas includes (p. 162) the Thirteen-spotted Ladybird in a list of insect enemies of the Colorado Potato Beetle, and also (p. 173) describes the adult beetle, but gives no further details concerning its habits.

Again in the Eighth Report of the same series (p. 174) Dr. Thomas briefly describes the imago, including it among other plant-lice enemies.

In his treatise on Insects Injurious to Fruits, Mr. Wm. Saunders includes this species among the enemies of the Apple Plant-louse (*Aphis mali*).

The aquatic habits of this Ladybird have, however, been recorded in Europe, although apparently not generally known, the only mention I have seen being by Mulsant, who states that this species is found upon aquatic plants.*

In view of the above facts, I think we may conclude that the Thirteen-spotted Ladybird has a decided preference for aquatic plants, upon which it, as a rule, develops, but that it also occasionally occurs among plant-lice on terrestrial vegetation.

DESCRIPTION.

The Thirteen-spotted Ladybird is shown at Plate II, Fig. 5, *b*. It has frequently been described in our entomological literature, and will be easily recognized from the figure.

The pupa is also shown on the same plate at Fig. 5, *a*. It may be described as follows:

PUPA.—Plate II, Fig. 5, *a*. Length 5 mm., width 3 mm. Form ovate. Color black: a narrow yellow band running caudad on dorso-meson from base of wing-sheaths to cauda, crossed near cephalic border of abdomen by a similar transverse band, the two making a good representation of a cross; the sides of the abdomen also more or less blotched with yellow, and in some specimens the thorax is blotched with the same color. The transverse band is sometimes interrupted with black on each side of the dorso-meson.

Described from many living specimens taken on aquatic plants, September, 1889.

8. ON THE EGGS OF THE GIANT WATER BUGS. (*Belostoma americanum*, Leidy, and *Benacus griseus*, Say.)

[Plate II, Fig's 6 and 7.]

Considerable confusion exists in entomological literature concerning the eggs of the insects named above. The subject was first brought up

* Coleopteres de France, Securipalpes, p. 34. "Elle se trouve sur les plantes aquatiques."

by the editors of the American Entomologist* in 1868, when the egg which, as I shall presently show, is that of *Belostoma americanum*, was figured and described as belonging to the Hellgrammite (*Corydalis cornutus*). Practically the same account was published by Dr. Riley in his Fifth Missouri Report (pp. 142-145); and also by Packard in his Guide to the Study of Insects (7th ed. p. 607).

In 1876, however, Dr. Riley read a paper before the American Association for the Advancement of Science, entitled "On the curious egg-mass of *Corydalis cornutus* (Linn), and on the eggs which have hitherto been referred to that species," in which he described the true eggs of the Hellgrammite, and made the following surmise concerning the others :

As to the nature of the eggs that have hitherto been mistaken for those of *Corydalis*, I can only surmise. The specimens from which the figure was made were destroyed with the Walsh cabinet in the Chicago fire; but I have a very distinct recollection of them, and judging from the nature of the eggs of *Perthostoma*, with which I am familiar, there is little doubt in my mind that these supposed eggs of *Corydalis* really belong to *Belostoma grande*, which is the only aquatic Heteropterous insect of sufficient size to lay them.†

I have been able to find no further references to the subject in the literature published since that time.

OBSERVATIONS.

While collecting insects on the edge of a pond on the outskirts of Lansing, Mich., July 3, 1882, I found a mass of eggs, like those figured in the Fifth Missouri Report (p. 143, Fig. 70) beneath a board lying at the water's edge. The eggs gave evidence of having been freshly laid, and beside them was a living *Belostoma americanum*. The following April I forwarded some of the eggs to Dr. Riley with an account of the circumstances of their capture, suggesting that the observation confirmed his surmise concerning their origin. In reply, Dr. Riley sent under date of April 30, 1883, a letter, in which he said :

I thank you sincerely for your communication and the specimens accompanying, sent by you on the 26th inst. An examination of the eggs demonstrates the correctness of your conclusion, and confirms my original surmise that these are the eggs of *Belostoma grande*. I am very much pleased to have the question thus settled.

Within the last few years it has been shown that *Belostoma grande* is a South American species, and that the insects belonging to this genus which occur in the northern United States are *Belostoma americanum*, Leidy, and *B. griseus*, Say. The latter, however, has lately been placed

* American Entomologist, V. I, No. 4.

† 9th Mo. Report, pp. 125-129.

in a sub-genus erected especially for it, and so is more correctly known as *Benacus griseus*.

The species figured by Dr. Riley as the probable parent of the eggs previously referred to *Corydalis* and there called *Belostoma grandis* is evidently *Benacus griseus*—a species which differs from the closely allied *Belostoma americanum*, (Plate II, Fig 7,) in its darker and more shining appearance, and especially in the shape and structure of the second joint (femur) of the first pair of legs. In *B. americanum* this joint is swollen in front near its base and has on its inner margin a longitudinal groove into which the next outer joint (tibia) can be fitted, while in *B. griseus* the inner margin of the anterior femur is much less swollen and has no groove for the reception of the tibia.

A recent examination of the specimen collected at Lansing, in connection with eggs mentioned above, showed that it was *B. americanum*, and consequently that the eggs figured by Riley belonged to this species rather than *B. griseus*, the eggs of which are apparently undescribed.

Early last April a living specimen of *B. griseus* was brought me in a small pail containing an inch or two of water. The insect was left in the water over night, and the next morning several large eggs had been laid by it.

I afterwards obtained the eggs a number of times by confining bugs caught at electric lights in vessels containing a little water. They were generally laid in masses resembling Fig. 6, Plate II, being fastened in place by a mucilaginous substance on the lower end. When first deposited the eggs were of a pale green color, but soon began to show brownish longitudinal stripes. The eggs were kept moist in the hope that they would hatch, but unfortunately none of them did so.

I have also received through the kindness of my brother, Howard E. Weed, two sets of eggs of *B. americanum* collected in Missaukee county, Michigan, near the northern extremity of the lower Peninsula. Both sets are on the same piece of wood. One had hatched, the young bugs escaping by the opening of a hinged cap on the top of the egg, but the other lot, which was deposited in part directly on top of the hatched set had never developed.

DESCRIPTION.

Belostoma americanum. Egg. [Riley's 9th Mo. Rept., Fig. 32.] Length 5 mm.; width 2 mm. Oblong-ovate. General color brown, spotted with black; lighter below a whitish crescent near top with a distinct black spot in its apex. This crescent indicates the margin of the cap by the opening of which the insects escape. Deposited in masses of forty to sixty or more, along the borders of ponds.

Described from many specimens.

Benacus griseus. Egg. Plate II, Fig. 6. Length 6 mm.; width 2.5 mm. General color of recently laid specimens greenish brown, with longitudinal stripes of darker brown. A faint indication of a whitish crescent near top, with a black spot in its apex. Deposited in masses, with a mucilaginous substance gluing them to each other at their bases, and to the substance on which they are laid.

Described from many specimens obtained from bugs in confinement.

ARTICLE III.—A PARTIAL BIBLIOGRAPHY OF INSECTS AFFECTING CLOVER.

BY CLARENCE M. WEED.

It rarely happens that such a combination of insect attack upon a great crop plant occurs that two vital parts are simultaneously destroyed, yet this is the condition of Clover in Ohio to-day. Not content with the destruction of the seed crop by the Midge which has taken place for years, Nature has thrust upon us a more serious enemy—the Clover Root-Borer. Both of these insects are present, especially in the northern part of the State, in vast numbers, and have caused no little apprehension as to the future production of this invaluable plant.

These two pests, however, are not alone in their destructive attack, but, on the contrary, are aided by a host of other species which work upon every part of the plant, from the tiny rootlet concealed beneath the surface, to the exposed stem, leaves and blossoms.

In view of these facts, and of the importance of the Clover plant to the agriculture of the State, I have undertaken an extended investigation of the insects affecting it; and as a basis for future work, have prepared the following bibliography, which, though by no means complete, is believed to include references to the great majority of the economic articles relative to the subject. In its preparation free use has been made of Dr. Lintner's list of Clover insects,* and in some cases of Mr. T. F. Hunt's Bibliography of Insects Affecting Indian Corn,† although generally when the bibliography has been published by him, I have not thought it worth while to duplicate his entries, but have simply referred to one or two of the more important articles, considered from the present point of view, and cited the reader to his article for the other references.

* Trans. N. Y. St. Agr. Soc., v. 32.

† Misc. Essays Econ. Entomology, Springfield, Ill., 1886, pp. 57-123.

In certain groups of insect, the locusts and grasshoppers for example, I have included only those species which have been known to do serious injury to clover, omitting a large number of species which undoubtedly occasionally include it among their food-plants.

At the end of the bibliography appears a systematic list of the insects discussed which shows that more than eighty species are known to attack clover. But I have no doubt that with advancing knowledge this list will be greatly extended, and that within the next few years it will reach a hundred.

Each entry has been made independent of all others in accordance with the most approved bibliographical methods.

PART I. BIBLIOGRAPHY.

ORDER LEPIDOPTERA.

Family PAPILIONIDAE.

1. THE DANEWORT BUTTERFLY. *Callidryas eubule*, Linn.

1878. FRENCH, G. H. *Callidryas eubule*. 7th. Rept. St. Ent. Ill., pp. 147-148.
Imago described. Occurs sparingly in Illinois. Three brooded. Larva feeds on the different species of CLOVER, and Lupine and sometimes may be found on pea-vines.
1881. MIDDLETON, NETTIE. *Callidryas eubule*. 10th. Rept. St. Ent. Ill., p. 78.
Larva said to be "not positively known, but that of a very closely allied species, if it is not synonymous" is described, and said to feed upon Cassia and CLOVER.

2. THE CAESONIA BUTTERFLY. *Colias caesonias*, Stoll.

1881. MIDDLETON, NETTIE. *Colias caesonias*. 10th. Rept. St. Ent. Ill., p. 78.
Larva described. Feeds on different species of CLOVER.

3. THE EURYTHEME BUTTERFLY. *Colias eurytheme*, Bd.

1878. FRENCH, G. H. *Colias eurytheme*. 7th. Rept. St. Ent. Ill., pp. 147-148.
Male, female and larva described. Larva feeds upon CLOVER, Lupine, and sometimes Peas.
1881. MIDDLETON, NETTIE. *Colias eurytheme*. 10th. Rept. St. Ent. Ill., p. 78.
Larva described. Feeds upon CLOVER, Lupine, and Pea-vines.

4. THE SULPHUR YELLOW BUTTERFLY. *Colias philodice*, Godt.

1862. HARRIS, T. W. *Colias philodice*. Treat. Ins. Inj. to Vegetation, 3rd. ed., pp 272-273; figs 100, 101.
Butterflies appear twice a year. Description of butterflies and caterpillar. Larva feeds on CLOVER, Medicago, Lucerne, and occasionally is found on Pea-vines.
1869. PACKARD, A. S. *Colias philodice*. Guide Study of Insects, p. 250.
Account of life-history from Scudder and Saunders. Three brooded. Larva feeds on CLOVER, Lupine and Pea.

1878. FRENCH, G. H. *Colias philodice*. 7th. Rept. St. Ent. Ill., 1877, pp. 147-148.
Short description of larva and butterfly. Larva feed on CLOVER, Lupine and Pea.
1882. SAUNDERS, WM. *Colias philodice*. Rept. Ent. Soc. Ont., 1881, pp. 47-48; figs. 20, 21.
Eggs deposited on CLOVER and also on Pea and Blue Lupine. Account of transformations. Common, but not reported as injurious.
1887. COOK, A. J. *Colias philodice*. Beal's Grasses of North America, v. I, pp. 388-389; fig. 143.
Bibliography. General account of life-history. Larvæ feed on CLOVER, peas, etc. Not known to do serious damage.

5. THE NICIPPE BUTTERFLY. *Terias nicippe*, Cram.

1878. FRENCH, G. H. *Terias nicippe*. 7th Rept. St. Ent. Ill., p. 148.
Description of imago and larva. Larva feeds on CLOVER and Cassia.
1881. MIDDLETON, NETTIE, *Terias nicippe*. 10th Rept. St. Ent. Ill., p. 79.
Short description of larva. Feeds on CLOVER, Senna and Cassia.

6. THE LISA BUTTERFLY. *Terias lisa*, Bd.

1878. FRENCH, G. H. *Terias lisa*. 7th Rept. St. Ent. Ill., p. 148.
Brief description of imago and larva. Latter feeds on leguminous plants.
1881. MIDDLETON, NETTIE. *Terias lisa*. 10th. Rept. St. Ent. Ill., p. 79.
Very brief description of larva. Said to feed on leguminous plants.

7. THE DELIA BUTTERFLY. *Terias delia*, Cram.

1882. LINTNER, J. A. *Terias delia*. Trans. N. Y. Agr. Soc., v. 37, p. 192; Ins. Clover Plant, p. 5.
Mentioned in a list of insects which prey upon CLOVER.

Family NYMPHALIDÆ.

8. MELITÆA EDITHA, Bd.

1882. LINTNER, J. A. *Melitæa editha*. Trans. N. Y. St. Agr. Soc., v. 37, p. 192; Ins. Clover Plant, p. 5.
Mentioned in a list of insects affecting CLOVER, on the authority of Henry Edwards.

Family LYCÆNIDÆ.

9. CHRYSOPHANUS AMERICANA, D'Urb.

1882. LINTNER, J. A. *Chrysophanus americana*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192.
Ins. Clover Plant, p. 5.
Mentioned in a list of CLOVER insects.

10. THE COMYNTAS BUTTERFLY. *Lycæna comyntas*, Godt.

1862. HARRIS, T. W. *Polyommatus comyntas*. Treat. Ins. Inj. to Veg., 3rd ed., p. 275. Butterfly described. Found in woods and pastures in July and August. Caterpillars feed upon leaves of *Lespedeza*.
1882. LINTNER, J. A. *Lycæna comyntas*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.
Included in list of CLOVER insects.

Family HESPERIDÆ.

11. EUDAMUS PYLADES, Scudd.

1882. LINTNER, J. A. *Eudamus pylades*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.
Mentioned in a list of CLOVER insects.

Family BOMBYCIDÆ.

12. ARCTIA ACHAIA, G. & R.

1882. LINTNER, J. A. *Arctia achais*. Trans. N. Y. Agr. Soc., v. 22, p. 192; Ins. Clover Plant, p. 5.
Mentioned in list of CLOVER insects on authority of Stretch.

13. THE HARNESSSED MOTH. *Arctia phalerata*, Harr.

1862. HARRIS, T. W. *Arctia phalerata*. Treat. Ins. Inj. Veg., 3rd ed., p. 347, fig. 66. Original description of moth. Caterpillar unknown.
1882. LINTNER, J. A. *Arctia phalerata*. Trans. N. Y. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.
Included in list of CLOVER insects.

14. THE ISABELLA TIGER MOTH. *Pyrrharcia isabella*, Sm.-Abb.

1862. HARRIS, T. W. *Arctia isabella*. Treat. Ins. Inj. Veg., 3rd ed., 1862, pp. 355-356, fig. 170.
Description of caterpillar and moth. Former "eats the leaves of CLOVER, Dandelion, Narrow-leaved Plantain and various other herbaceous plants."

15. THE FALL WEB-WORM. *Hyphantria cunea*, Drury.

1882. LINTNER, J. A. *Hyphantria textor*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.
Mentioned in a list of insects affecting CLOVER.

16. THE IO MOTH. *Hyperchiria io*, Fabr.

1873. RILEY, C. V. *Saturnia (Hyperchiria) io*. 5th Rept. St. Ent. Mo., pp. 133-136, f. 63-66.

Lengthy account of life-history with elaborate description of larval changes. Larva feeds on *Amorpha fruticosa*, *Baptisia*, *Prunus serotina*, CLOVER, Sassafras, Black Locust, Indian Corn, Willows, Elm, Hop-vine, Balsam Poplar, Balm of Gilead, Dogwood, Choke Cherry, Currant, Cotton, and perhaps on Ironweed, (*Vernonia*.) Parasites are a species of *Microgaster*, and *Ophion macrurum*.

1886. HUNT, THOS. F. *Hyperchiria io*. Misc. Ess. Ec. Ent., Springfield, Ill., 1886, pp. 62-63.

Bibliography as a corn insect; seventeen entries.

Family NOCTUIDÆ.

17. THE SHAGREENED CUTWORM. *Agrotis malefida*, Guen.

1885. RILEY, C. V. *Agrotis malefida*. Rept. U. S. Dept. Agr., 1884, pp. 292-293, pl. II, fig. 3.

Treated as a cabbage cutworm. Larva resembles *A. annexa*. Extended description of larva and pupa. Food-plants include CLOVER, grass, Cabbage, Cotton and different weeds.

18. THE BLACK ARMY WORM. *Agrotis fennica*, Tausch.

1884. COOK, A. J. *Agrotis fennica*. Rept. Mich. St. Bd. Agr., 1883, pp. 3-6, figs. 1-4.

Account of outbreak in Michigan. Description and figure of larva, pupa and moth. A dipterous parasite is described by Williston as *Scopolia sequax*, n. sp. Food consists of onions, peas, buds of fruit trees, every garden flower and plant, grass, CLOVER, Dock and Mullein.

19. THE GRANULATED CUTWORM. *Agrotis annexa*, Treitsch.

1885. RILEY, C. V. *Agrotis annexa*. Rept. U. S. Dept. Agr., 1884, pp. 291-292, pl. II, fig. 1.

General discussion of the insect, especially as a cabbage cut-worm. All stages described. Larva feeds on grass, CLOVER, Plantain, Dandelion, Cabbage, Cotton, and many other plants.

20. THE VARIEGATED CUTWORM. *Agrotis saucia*, Hübn.

1882. LINTNER, J. A. *Agrotis saucia*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192. Insects Clover plant, p. 5.

Included in a list of insects affecting CLOVER.

1884. RILEY, C. V. *Agrotis saucia*. Rept. U. S. Dept. Agr., 1884, p. 297-298.

General account of life-history and habits.

1886. HUNT, THOS. F. *Agrotis saucia*. Misc. Ess. Ec. Ent., Springfield, Ill., 1886, p. 72.

Bibliography as a corn insect; eleven entries.

21. THE CLOVER MAMESTRA. *Mamestra trifolii*, Esp.

1882. LINTNER, J. A. *Mamestra trifolii*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.

Included in list of CLOVER insects.

22. MAMESTRA RENIGERA, Steph.

1882. LINTNER, J. A. *Mamestra renigera*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.

Included in a list of insects affecting CLOVER.

23. THE ZEBRA CATERPILLAR. *Mamestra picta*, Harr.

1842. HARRIS, T. W. *Mamestra picta*. Treat. Ins. Inj. Veg., 1st ed., 1842, pp. 328-329; 2d ed., 1852, pp. 350-351; 3d ed., 1862, pp. 450-451, figs. 223, 224.

Original description of larva, chrysalis and moth, with account of life-history. Two brooded. Larva feeds on cabbages, cauliflowers, spinach, beets, and other garden vegetables with succulent leaves. Hand-picking suggested as a remedy.

1870. RILEY, C. V. *Mamestra picta*. 2d Rept. St. Ent. Mo., pp. 112-113, fig. 82.

Account of life-history and habits. Larva feeds on Cabbage, beets, spinach, snow-berry, (*Symphoricarpos racemosus*), honey-suckle, mignonette, asters, asparagus, Lambs-quarter (*Chenopodium album*), and "are also said to occur on the flowers of CLOVER." Figure of moth and caterpillar.

1882. LINTNER, J. A. *Ceramica picta*. Trans. N. Y. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.

Included in list of CLOVER insects on authority of Glover.

1883. RILEY, C. V. *Ceramica picta*. Rept. U. S. Dept. Agr., 1883, pp. 124-125; Pl. I, figs. 3, 3a; pl. XII, figs. 2a, 2b.

General article describing various stages, habits and life-history. Food-plants: garden vegetables, especially cruciferous plants, asters, snow-berry (*Symphoricarpos racemosus*), Lambs-quarter (*Chenopodium album*), and "are also said to occur on the flowers of CLOVER." Hand-picking when young recommended.

1885. BRUNER, LAWRENCE. *Mamestra picta*. Rept. U. S. Dept. Agr., 1884, p. 401.

Mention of occurrence on cabbage in Nebraska.

24. PRODENIA COMMELINÆ, Sm.-Abb.

1882. LINTNER, J. A. *Prodenia commelinae*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.

Included in a list of insects affecting CLOVER, on authority of Dr. Riley.

25. THE BRONZE-COLORED CUTWORM. *Nephelodes violans*, Grote.

1882. LINTNER, J. A. *Nephelodes violans*. 1st. Rept. on Inj. and other Ins. St. N. Y., pp. 99-110, f. 24, 25.

Elaborate discussion under following heads; Bibliography; caterpillars in St. Lawrence county; unsuccessful attempt to rear the caterpillars; description

of the larva; notes of the occurrence of the larvæ; published observations on the larvæ; the moth; distribution of the species; its natural history; parasitic attack; preventives and remedies. Feeds on grasses, CLOVER and other plants.

1886. HUNT, THOS. F. *Nephelodes violans*. Misc. Essays Ec. Ent., pp. 75-76.
Bibliography as a corn insect; fifteen entries.

26. THE ARMY WORM. *Heliothila unipuncta*, Haw.

1883. RILEY, C. V. *Leucania unipuncta*. Third Rept. U. S. Ent. Comm., pp. 89-156; pl. I, and II.
An elaborate account of the history, life-history, enemies and means of prevention, with an extended bibliography. "Ordinarily Clover is disregarded by the worms, though they occasionally nibble at it." (p. 116.)

27. THE CABBAGE PLUSIA. *Plusia brassicae*, Riley.

1870. RILEY, C. V. *Plusia brassicae*. 2nd Rept. St. Ent. Mo., pp. 110-112; f. 81.
Original description of larva, pupa and moth. Larva very injurious to cabbage.
1884. RILEY, C. V. *Plusia brassicae*. Rept. U. S. Dept. Agr., 1883, pp. 119-122, pl. I, t. 2, 2 a, pl. XI, t. 2.
Elaborate discussion under following sub-heads: Range; food-plants; habits and natural history; closely related to an European species; natural enemies; remedies. Food-plants are: cabbage, kale, turnip, tomato, mignonette, dandelion, dock, Crepis, Chenopidium, CLOVER, *Senecio scandens*, Celery, Japan quince, lettuce. Natural enemies are: *Apanteles congregatus*, *Copidosoma truncatellum*, and a fungus, *Botrytis rileyi*, Farlow.

28. THE BOLL WORM. *Heliothis armigera*, Hübner.

- BARRETT. *Heliothis armigera*. Ent. Monthly Magazine, v. XIV, p. 151.
[Not seen. Cited by Lintner in list of Clover insects, Trans. N. Y. Agr. Soc., p. 206.]
For further bibliography of this insect see Fourth Report U. S. Ent. Comm., pp. 382-384.

29. THE CLOVER DRASTERIA. *Drasteria erechtea*, Cram.

1869. PACKARD, A. S. *Drasteria erechtea*. Guide Study of Insects, pp. 317-318.
General description of moth, with description of caterpillar from Saunders. Latter feeds on CLOVER.
1876. SAUNDERS, WM. *Drasteria erechtea*. Rept. Ent. Soc. Ont., 1875, p. 36.
Account of life-history.
1878. FRENCH, G. H. *Drasteria erechtea*. 7th Rept. St. Ent. Ill., pp. 233-234.
Moth and larva described. Author supposed that CLOVER was the only plant on which larva fed, but was informed by Dr. E. R. Boardman that the moth had been reared from a chrysalis taken from a potato stalk.
1881. COQUILLETT, D. W. *Drasteria erechtea*. 10th Rept. St. Ent. Ill., p. 148.
Description of larva. "Feeds on grass. May to October. Spins a cocoon."

1882. SAUNDERS, WM. *Drasteria erechtea*. Rept. Ent. Soc. Ont., 1881, p. 47; fig. 19.
Common, but never reported to do much damage. Account of life-history with description of various stages. Larva feeds on CLOVER.
1887. COOK, A. J. *Drasteria erechtea*. Beal's Grasses of North America, v. I, pp. 387-388, fig. 142.
- Bibliography. Moth common in Michigan. Description of larva and moth.
"Though so common, and though with slight exception (it sometimes feeds on grass), the caterpillars feed exclusively on CLOVER, yet I think the insect is not considered a foe to be dreaded."

30. *HYPENA SCABRA*, Fabr.

1881. COQUILLET, D. W. *Hypena scabra*. 10th. Rept. St. Ent. Ill., p. 148.
Larva described. Feeds on CLOVER. May to September.

Family GEOMETRIDÆ.

31. *HÆMATOPIS GRATARIA*, Fabr.

1885. FORBES, S. A. *Hæmatopis grataria*. 14th. Rept. St. Ent. Ill., p. 74.
Larva abundant on WHITE CLOVER.

32. *ASPILATES DISSIMILARIA*, Hübner.

1882. LINTNER, J. A. *Aspilates dissimiliaria*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192;
Ins. Clover Plant, p. 5.
Included in a list of insects affecting CLOVER.

33. THE CLOVER GEOMETER. *Cymatophora crepuscularia*, Tr.

1885. FORBES, S. A. *Cymatophora crepuscularia*. 14th. Rept. St. Ent. Ill., p. 72; pl. VI, fig. 5.
Larva taken on WHITE CLOVER; Rose, Common Locust and Box-elder. Larva described.

34. *EUPITHESIA INTERRUPTOFASCIATA*, Pack.

1881. COQUILLET, D. W. *Eupithesia interruptofasciata*. Papilio, v. I, p. 56-57.
Description of larva, which feeds on CLOVER.

Family PYRALIDÆ.

35. MEAL SNOUT MOTH. *Asopia farinalis*, L.

1869. PACKARD, A. S. JR. *Pyralis farinalis*. Guide to Study of Insects, p. 328.
Brief description of moth. Larva "feeds on straw and corn, and Mr. Riley has found it feeding on CLOVER."

1886. HUNT, THOS. F. *Asopia farinalis*. Misc. Essays Ec. Ent., Springfield, 1886, p. 86.

Bibliography as a corn insect; ten entries.

36. THE CLOVER HAY WORM. *Asopia costalis*, Fabr.

1874. RILEY, C. V. *Asopia costalis*. 6th. Rept. St. Ent. Mo., pp. 102-107.
Account of life-history. Larva feeds on CLOVER HAY. Probably imported.
Past history and damage. Description all stages except egg. New hay should not be put on old.
1878. FRENCH, G. H. *Asopia costalis*. 7th. Rept. St. Ent. Ill., pp. 247-248.
Account of life history and habits, mostly compiled from Riley.
1882. SAUNDERS, WM. *Asopia costalis*. Rept. Ent. Soc. Ont., 1881, pp. 45-46; fig. 18.
Account of life-history with description of all stages. Larva feeds on CLOVER HAY. Two or more brooded. New hay should not be stacked with old.
1887. COOK A. J. *Asopia costalis*. Beal's Grasses of North America, v. I, pp. 393-395; fig. 146.

Bibliography. General account of life-history, with short descriptions of various stages. Larva "works on dried CLOVER or CLOVER Hay while in the mow or stack." Advises that old hay be not left in mow from season to season.

37. *ASOPIA OLINALIS*, Guen.

1882. LINTNER, J. A. *Asopia olinalis*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.
Mentioned in a list of CLOVER insects.

38. *TETRALOPHA*, N. Sp., Lintner.

1882. LINTNER, J. A. *Tetralopha*. N. Sp. Trans. N. Y. St. Agr. Soc., v. 32, p. 192; Ins. Clover Plant, p. 5.
Included in a list of CLOVER insects.

39. THE INDIAN MEAL MOTH. *Ephestia interpunctella*, Hübn.

1856. FITCH, ASA. *Tinea zea*. 2nd Rep. Ins. N. Y., p. 320; pl. IV, fig. 1.
Described as new. Said to "live in stale Indian meal and emptying cake made thereof."
1860. CLEMENS, B. *Ephestia interpunctella*. Proc. Acad. Nat. Sci. Phila., 1860, p. 206.
Description.
1880. RILEY, C. V. *Ephestia zea*. Amer. Ent., v. III, p. 229.
Reported from Massachusetts. Larva and its habits described.
1882. GROTE, AUG. R. *Ephestia interpunctella*. New Check List N. Am. Moths, p. 55.
E. zea given as a synonym.
1886. HUNT, THOS. F. *Ephestia zea*. Misc. Ess. Ec. Ent., Springfield, Ill., 1886, p. 91.
Bibliography as a corn insect; two entries.

Family TORTRICIDÆ.

40. THE OBLIQUE BANDED LEAF ROLLER. *Cacocia rosaceana*, Harris.

1842. HARRIS, T. W. *Lozotaenia rosaceana*. Treat. Ins. Inj. Veg., 1st ed., pp. 347-348; 2nd ed., 1852, pp. 375-376; 3rd ed., 1862, pp. 480-481, fig. 238.
Caterpillars curl up terminal leaves of apple and rose. Pupate in June, and moth emerges early in July. Latter described for first time.
1859. FITCH, ASA. *Lozotaenia rosaceana*. 3rd Rept. Ins. N. Y., p. 28.
Brief general descriptive account. Worms and moths vary greatly as reared upon Rose, Apple, Peach, Cherry, or other leaves. Surmises that it may be same as the European *L. rosana*, Linn.
1860. CLEMENS, B. *Lozotaenia rosaceana*. Proc. Acad. Nat. Sci. Phila., 1860, p. 347.
Description of moth. "The larva binds together the leaves of the Rose and other plants."
1863. WALKER, FR. *Teras vicariana*. Cat. Lep. Het. XXVIII, p. 287.
Described as new.
1869. ROBINSON, C. T. *Tortrix rosaceana*. Trans. Am. Ent. Soc., v. II, p. 262, pl. I, figs. 1-3.
[Not seen.]
1869. PACKARD, A. S. *Lozotaenia rosaceana*. Guide Study Ins., p. 335, pl. 8, fig. 12.
Brief account of life-history. Larva feeds on Rose, Apple and Strawberry.
1869. PACKARD, A. S. *Lozotaenia gossypiana*. Guide Study Ins., pp. 335-336.
Species described as new from Grover's plate in article on cotton insects in Patent Office Report for 1853 . 82, pl. VII, fig. 1.
1878. FRENCH, G. H. *Lozotaenia rosaceana*. 7th Rept. St. Ent. Ill., p. 256.
General account of life-history. Two broods in a season. Hand-picking suggested as a remedy.
1881. COQUILLET, D. W. *Lozotaenia rosaceana*. 10th Rept. St. Ent. Ill., p. 153.
Larva described. Feeds on Apple, Cherry, Crab-apple and Horse Chestnut.
1882. COQUILLET, D. W. *Lozotaenia rosaceana*. 11th Rept. St. Ent. Ill., pp. 10-15.
An elaborate article discussing life-history, habits, food-plants, natural enemies and remedies. Two-brooded. Bred from Apple, Cherry, Siberian Crab-apple, Lilac, Horse-chestnut, Raspberry, Strawberry, Rose, Burdock (*Lappa officinalis*), Thistle, (*Cirsium lanceolatum*), RED CLOVER, Rag-weed (*Ambrosia artemisiifolia*), Smart-weed (*Polygonum pennsylvanicum*), Knot-grass (*P. aviculare*), and larva found on Dogwood, Burr-oak, Poplar, Hazel, Sumac, Wild Raspberry (*Rubus strigosus*), Wild Blackberry, (*R. villosus*), Wild Sunflower (*Helianthus grosse-serratus*), and Blue Vervain (*Verbena hastata*). Destruction of larvæ by hand, and spraying with arsenites suggested as remedies.
1882. FERNALD, C. H. *Cacocia rosaceana*. Trans. Am. Ent. Soc., v. X, p. 10.
Bibliography; Habitat (Maine to California), and food-plants; latter being as follows: Rose, Apple, Peach, Cherry, Yellow Birch, Plum, Cotton, CLOVER, Honeysuckle, Beans, Strawberry, *Cornus stolonifera*, *Crataegus*.
1885. FORBES, S. A. *Cacocia rosaceana*. 14th Rept. St. Ent. Ill., pp. 74, 97, 109.
Bred from CLOVER and *Acer dasycarpum*. Larvæ also observed eating out pistils and stamens of freshly opened Apple blossoms.

41. *LOPHODERUS TRIFERANA*, Walker

1882. LINTNER, J. A. *Tortrix incertana*. Ins. Clover Plant, p. 5.
Included in list of CLOVER insects.

42. *TORTRIX PALLORANA*, Robinson.

1869. ROBINSON, C. H. *Tortrix pallorana*. Trans. Am. Ent. Soc., v. II, p. 266; pl. I, fig. 13.
Original description.
1882. FERNALD, C. H. * *Tortrix pallorana*. Trans. Am. Ent. Soc., v. X, p. 17.
Habitat given as Mass., N. Y., Penn., Ohio, Ill., Texas. Food-plants: Cherry, *Silphium integrifolium*, *Verbena hastata*.
1885. FORBES, S. A. *Tortrix pallorana*. 14th Rept. St. Ent. Ill., p. 74; pl. VI, fig. 9.
Reared from larvæ feeding on CLOVER.

43. THE SULPHUR LEAF ROLLER. *Dichelia sulphureana*, Clemens.

1885. FORBES, S. A. *Dichelia sulphureana*. 14th Rept. St. Ent. Ill., pp. 17-20.
History of literature; description of all stages but the egg; distribution; life-history; injuries. Besides food-plants before noted, it has been bred from Indian corn, Common Burdock, (*Lappa major*), *Verbena urticifolia*, *Monarda fistulosa*, and *Erigeron canadense*. Also bred from RED CLOVER. Three Ichneumonid parasites reared.
1886. HUNT, THOS. F. *Dichelia sulphureana*. Misc. Essays Ec. Ent., Springfield, Ill., 1886, pp. 88-89.
Bibliography as a corn insect. Six entries.
1887. COOK, A. J. *Tortrix sulfureana*. Beal's Grasses North America, v. I, pp. 386-387.
General account of life-history of this and other CLOVER leaf rollers.

44. THE PALE CLOVER TORTRICID. *Amphisa discopunctana*, Clemens.

1860. CLEMENS, B. *Coelostathma discopunctana*. Proc. Phila. Acad. Nat. Sci., 1860, p. 355.
Original description.
1869. ROBINSON, C. T. *Tortrix discopunctana*. Trans. Am. Ent. Soc., vol. II, p. 270; pl. 6, fig. 51.
[Not seen.]
1881. COMSTOCK, J. HENRY. *Tortrix discopunctana*. Rept. U. S. Dept. Agr., 1880, p. 258.
Pupæ found in rolled leaves of CLOVER. Pupa and adult described.
1882. FERNALD, C. H. *Amphisa discopunctana*. Trans. Am. Ent. Soc., vol. X, p. 22.
Synonymy. Found in Maine, Mass., N. Y., Penna., D. C., Mo., Tex. Food is CLOVER.

45. THE RUSTY BROWN TORTRICID. *Platynota flavedana*, Clemens.

1860. CLEMENS, B. *Platynota flavedana*. Proc. Phila. Acad. Nat. Sci., 1860, p. 348.
Original description.

1863. WALKER, FRANCIS. *Tortrix concursana*. Cat. Lep. Het., vol. XXVIII, p. 324.
Redescribed as new.
1869. ROBINSON, C. T. *Tortrix flavedana*. Trans. Am. Ent. Soc., vol. II., p. 278, pl. 6,
fig. 55.
Male moth described.
1869. ROBINSON, C. T. *Tortrix laterana*. Trans. Am. Ent. Soc., vol. II, p. 278, pl. 6,
fig. 56.
Female moth described as a new species.
1881. COMSTOCK, J. HENRY. *Tortrix flavedana*. Rept. U. S. Dept. Agr., 1880, pp. 257-
258.
Larvæ feed on leaves RED CLOVER and WHITE CLOVER. Proved by breeding that
T. laterana, Robs. is of this species. Apparently two-brooded. Distribution
and food-plants. Two hymenopterous parasites bred.
1882. FERNALD, C. H. *Platynota flavedana*. Trans. Am. Ent. Soc., vol. X, p. 22.
Synonymy. Food-plants are: CLOVER, Rose, Sassafras, Maple. Found in
Maine, Massachusetts, New York, Pennsylvania, Texas and District of Co-
lumbia.
1887. COOK, A. J. *Tortrix flavedana*. Beal's Grasses of North America, v. I, pp. 386-
387.
General account of habits and life-history of this and other CLOVER leaf rollers.

46. THE CLOVER SERICORIS. *Sericoris instrutana*, Clem.

1865. CLEMENS, B. *Sericoris instrutana*. Proc. Ent. Soc. Phila., v. V., p. 135.
Original description.
1875. ZELLER, P. C. *Sericoris poana*. Beitr., p. 76.
Described as new.
1881. COMSTOCK, J. H. *Sericoris instrutana*. Rept. U. S. Dept. Agr., 1880, p. 258.
Larvæ feeding on leaves of RED CLOVER, folding up leaflets and lining them with
silk.
1882. FERNALD, C. H. *Sericoris instrutana*. Trans. Am. Ent. Soc., v. X, p. 65.
Synonymy. Feeds on CLOVER, and *Aesculus glabra*. Found in Maine, Massachu-
setts, New York, Pennsylvania and Ohio.
1887. COOK, A. J. *Sericoris instrutana*. Beal's Grasses of North America, v. I, pp. 386-
387.
General account of life-history of this and other CLOVER leaf rollers.

47. PHOXOPTERIS ANGULIFASCIANA, Zell.

1875. ZELLER, P. C. *Phoxopteris angulifasciana*. Beitr., p. 50, pl. VIII, fig. 10.
Original description.
1880. FERNALD, C. H. *Phoxopteris angulifasciana*. Psyche, v. VIII, p. 88.
Larva feeds on CLOVER.
1882. FERNALD, C. H. *Phoxopteris angulifasciana*. Trans. Am. Ent. Soc., v. X, p. 50.
Occurs in Maine, Massachusetts and Ohio. Food-plant is CLOVER.

48. THE CLOVER-SEED CATERPILLAR. *Grapholita interstinctana*. Clemens.

1860. CLEMENS, BRACKENRIDGE. *Stigmonota interstinctana*. Proc. Acad. Nat. Sci. Phila., 1860, p. 351.
Original description of adult.
1863. WALKER, FRANCIS. *Dicrorampha scitana*. Cat. Lep. Het., p. 413.
Described as new.
1873. GROTE, A. R. *Grapholita distema*. Bull. Buffalo Soc. Nat. Sci., vol. I, p. 92.
Again described as new. Habitat New York and Pennsylvania.
1881. COMSTOCK, J. HENRY. *Grapholita interstinctana*. Rept. U. S. Dept. Agr., 1880, pp. 254-255.
Larvæ found in July, 1874, in New York, on CLOVER heads, eating into and destroying the seed. Cocoons spun among florets. Also found at Washington, D. C., where there were probably three broods a season. A parasite, *Phanerotoma tibialis*, bred from it. Larva and pupa described at length, and Grote's description of adult quoted. Cutting clover early in June recommended as a remedy.
1887. COOK, A. J. *Grapholita interstinctana*. Beal's Grasses of North America, v. I, pp. 392-393.
Description of several stages. "A single larva feeds on several, and often all the seeds of a single head of CLOVER." Probably two-brooded. "By cutting the crop early we might destroy the larvæ, though I should fear we would not."

49. THE CLOVER LEAF MINER. *Gelechia roseosuffusella*, Clem.

1872. CHAMBERS, V. T. *Gelechia roseosuffusella*. Can. Ent., v. IV, pp. 69, 148, 169, 193.
[Not seen.]
1874. CHAMBERS, V. T. *Gelechia roseosuffusella*. Can. Ent., v. VI, p. 231.
[Not seen.]
1874. MURDTFELT, M. E. *Gelechia roseosuffusella*. Can. Ent., v. VI, p. 222.
[Not seen.]
1877. CHAMBERS, V. T. *Gelechia roseosuffusella*. Can. Ent., v. IX, p. 14.
Moth received from Utah. It is very widely distributed over North America.
1878. CHAMBERS, V. T. *Gelechia roseosuffusella*. Bull. U. S. Geol. and Geog. Surv. Terr., v. IV, pp. 110, 146.
On page 110 states that larva mines leaves of RED CLOVER, and on page 146 gives a list of bibliographical references.
1882. LINTNER, J. A. *Gelechia roseosuffusella*. Trans. N. Y. St. Agr. Soc., v 32, p. 192;
Ins. Clover plant, p. 5.
Mentioned in a list of insects affecting CLOVER, on authority of Riley.

50. ANAPHORA AGROTIPENNELLA, Grote.

1872. GROTE, A. R. *Anaphora agrotipennella*. Can. Ent., v. IV, p. 137.
[Not seen.]
1876. GROTE, A. R. *Anaphora agrotipennella*. Can. Ent., v. VIII, p. 185.
[Not seen.]

1878. CHAMBERS, V. T. *Anaphora agrotipennella*. Bull. U. S. Geol. and Geog. Surv. Terr., v. IV, pp. 110-129.

On page 110 states that larva feeds in CLOVER sod, and on page 129 gives bibliographical references.

ORDER DIPTERA.

Family OSCINIDÆ.

51. THE CLOVER-LEAF OSCINIS. *Oscinis trifolii*, Burgess.

1880. COMSTOCK AND BURGESS. *Oscinis trifolii*. Rept. U. S. Dept. Agr., 1879, pp. 200-201.

Comstock refers to discovery of a larva mining the upper surface of WHITE CLOVER leaves in the District of Columbia, which when reared proved to be a new species of Oscinis which Burgess describes as *O. trifolii*. Probably three broods in a season.

1882. LINTNER, J. A. *Oscinis trifolii*. Rept. N. Y. Agr. Soc., 1882, p. 205. Ins. Clover Plant, p. 17.

Life-history and habits from Comstock.

1887. COOK, A. J. *Oscinis trifolii*. Beal's Grasses of North America, v. I, p. 385.

Bibliography. Habits of related species. Account of life-history from Comstock.

Family CECIDOMYIDÆ.

52. THE CLOVER-SEED MIDGE. *Cecidomyia leguminicola*, Lint.

1879. LINTNER, J. A. *Cecidomyia* sp? Can. Ent., v. XI, p. 44; March, 1879.

Worms found in CLOVER heads during 1877-8 destroying seeds. Conjectured to be a species of *Cecidomyia*.

1879. LINTNER, J. A. *Cecidomyia* sp. Can. Ent., v. XI, pp. 121-124; July, 1879.

Perfect insect raised from worms in CLOVER heads proves to be a *Cecidomyia*, apparently undescribed.

1879. RILEY, C. V. *Cecidomyia leguminicola*. Rept. U. S. Dept. Agr., 1878, pp. 250-252.

Received from western New York where it is very injurious to clover. Life-history similar to that of wheat-midge. Description of all stages except egg and pupa. Comparison with wheat-midge and Hessian fly. Probably present for many years. "If the injuries of this insect should become serious, the clover-seed raiser will be obliged to abandon for a series of years the growth of this crop, as in no other way are we likely to affect the multiplication of the enemy."

1880. COMSTOCK, J. H. *Cecidomyia legumenicola*. Rept. U. S. Dept. Agr., 1879, pp. 193-197.

Occurs in Vermont, District of Columbia and Virginia, and probably in all states adjacent to New York. WHITE CLOVER is also infested. Eggs and pupa described. Variations in the larvæ and adult noted. Certainly two and possibly three broods in New York. Early cutting of clover recommended as best remedy. Two parasites recorded—*Eurytoma funebris*, n. s., and *Platygaster error*, Fitch.

1882. LINTNER, J. A. *Cecidomyia leguminicola*. Rept. N. Y. St. Bd. Agr., 1882, p. 198.
Ins. Clover Plant, pp. 11-16, figs. 3-5.
Life-history, injuries, etc.
1882. SAUNDERS, WM. *Cecidomyia leguminicola*. Rept. Ent. Soc. Ont., 1881, pp. 38-43.
Description of egg, larva, pupa and fly, with account of life-history and parasites. Danger of distribution in Clover seed mentioned, and early cutting of Clover advised as a remedial measure.
1882. LINTNER, J. A. *Cecidomyia leguminicola*. 1st Rept. Inj. and Other Ins. N. Y., p. 54.
Thinks gas lime would be a good remedy.
1885. RILEY, C. V. *Cecidomyia leguminicola*. Rept. U. S. Dept. Agr., 1884, p. 411
Specimens received from Mifflin county, Pennsylvania, where seed crop of CLOVER had been entirely destroyed.
1887. COOK, A. J. *Cecidomyia leguminicola*. Beal's Grasses of North America, v. I., pp. 389-392; figs. 144-145.
Bibliography. Exists in Virginia, Pennsylvania, New Jersey, Michigan, Ontario and New York. General account of life-history and injuries. "The only remedy suggested is deep plowing when the larvæ are yet only partly grown. It has been suggested that abandoning clover for a time might be wise. That this will suffice is hardly to be expected."
1888. LINTNER, J. A. *Cecidomyia leguminicola*. 4th Rept. Inj. and Other Ins. N. Y., p. 12.
Less damage reported from central New York than previously. Note of appearance in Canada and extract from Fletcher concerning preventive measures.

53. THE CLOVER-LEAF MIDGE. *Cecidomyia trifolii*, Löw.

1874. LÖW, FRANCIS. *Cecidomyia trifolii*. Verhandl. der Zool.-Bot. Gesellsch., Wien. 1874, p. 143. Translation in Rept. U. S. Dept. Agr., 1879, p. 198.
Original description of larva, gall, pupa, male and female. Occurs on RED CLOVER.
1880. COMSTOCK, J. H. *Cecidomyia trifolii*. Rept. U. S. Dept. Agr., 1879, pp. 197-199.
First announcement of occurrence in America. Found at Washington on WHITE CLOVER. First flies seen appeared June 23. Descriptive notes on appearance of larva, cocoon and adult, followed by translation of Löw's original article describing the insect.
1882. SAUNDERS, WM. *Cecidomyia trifolii*. Rept. Ent. Soc. Ont., 1881, p. 45; fig. 17.
Short sketch of life-history compiled from Comstock.
1882. LINTNER, J. A. *Cecidomyia trifolii*. Rept. N. Y. St. Ag. Soc., 1881-82, p. 203.
Ins. Clover Plant, pp. 15-16, Fig. 6.
Life-history after Comstock.
1887. COOK, A. J. *Cecidomyia trifolii*. Beal's Grasses of North America, v. I., pp. 383-385; Fig. 141.
Account of life-history mostly compiled from Comstock. "Even in considerable numbers it does no very serious harm. and unless it change its habits will never be a serious pest."

ORDER COLEOPTERA.

Family EROTYLIDAE.

54. THE CLOVER STEM BORER. *Languria mozardi*, Latr.

1802. LATREILLE. Gen. Crus. et. Ins., v. III, p. 66.
Original description.
1853. MELSHEIMER, F. E. *Languria mozardi*. Cat. Col. U. S. p. 47.
Bibliographical references.
1874. LE BARON, WM. *Languria mozardi*. 4th Rept. St. Ent. Ill., p. 181.
Brief description of adult.
1880. COMSTOCK, J. H. *Languria mozardi*. Rept. U. S. Dept. Agr., 1879, pp. 199-200;
pl. I, fig. 6.
Larvae bore pith of stalks of RED CLOVER. Eggs inserted in stem; larva changes
to pupa in lower part of its burrow. One brood a season, adult beetle hiber-
nating. Larva described at length. Two immature parasites found in burrow.
1882. SAUNDERS, WM. *Languria mozardi*. Rept. Ent. Soc. Ont., 1881, pp. 44-45; fig. 16.
Account of life-history after Comstock.
1882. LINTNER, J. A. *Languria mozardi*. Rept. N. Y. St. Agr. Soc., 1881-82, p. 196;
fig.; Ins. Clover Plant, pp. 9-11; fig. 2.
Bibliography, life-history, remedies.
1887. COOK, A. J. *Languria mozardi*. Beal's Grasses of North America, v. I, pp. 378-
380; fig. 189.
Bibliography. Life-history after Comstock with his illustration. Widely dis-
tributed. In case insect is destructive, early cutting of CLOVER is suggested
as a remedy.

55. LACHNOSTERNA SERRICORNIS, Lec.

1882. WEBSTER, F. M. *Lachnosterna serricornis*. Am. Nat. v. XVI, p. 746.
Notice of injury to CLOVER.

Family CHRYSOMELIDAE.

56. THE GRAPE VINE COLASPIS. *Colaspis brunnea*, Fabr.

1788. FABRICIUS, — *brunnea*.
Original description.
1824. SAY, THOMAS. *Eumolpus flavidus*. Le Conte ed. Compl. Writings, vol. I, p. 196.
Described as new.

1865. GLOVER, TOWNEND. *Colaspis* Sp. Rept. U. S. Dept. Agr. 1865, p. 91.
A *Colaspis* very similar to *C. strigosa* reported as doing serious injury to grape-vines.
1866. FITCH, ASA. *Colaspis brunnea*. Country Gentleman, Aug. 30, 1866.
Reported by correspondent destroying grape-vines.
1867. WALSH, B. D. *Colaspis flavida*. Pract. Ent., vol. II, pp. 68-69.
Reported by several correspondents to prey on terminal shoots and young leaves of grape in Ohio and Illinois. Adult figured. Synonymy discussed.
1872. RILEY, C. V. *Colaspis flavida*. Third Rept. St. Ent. Mo., pp. 81-84; figs. 37, 38.
Discussion of injuries to grape-vine, synonymy, and larval habits. Adult thought to devour larvae of Grape Leaf-folder (*Desmia maculalis*). Larvae feed on strawberry roots. Larva described.
1883. SAUNDERS, WM. *Colaspis brunnea*. Insects Injurious to Fruits, Philadelphia 1883, pp. 282-283; figs. 291, 292.
Life-history after Riley.
1884. FORBES, S. A. *Colaspis brunnea*. 13th Rept. St. Ent. Ill., pp. 156-176.
Long discussion as an enemy of strawberries. Literature treated of and all stages described. Larvae feed on strawberry roots. Single brooded; larvae hatching in spring, and becoming full grown by July; adults eat leaves of Strawberry and Grape, and has been found feeding on blossoms of CLOVER and willow.

57. THE CORN ROOT WORM BEETLE. *Diabrotica longicornis*, Say.

1824. SAY, THOMAS. *Galleruca longicornis*. Jour. Acad. Nat. Sci. Phila., vol. III, p. 460; Le Conte ed., Comp. Writings, vol. II, p. 223.
Original description of adult. Specimens collected near Rocky Mountains.
1883. FORBES, S. A. *Diabrotica longicornis*. 12th Rept. St. Ent. Ill., pp. 10-31; figs. 1-5.
Extended and complete account life-history of the insect, its injuries and the best means of preventing them. In three beetles taken from clover blossoms Nov. 18, 1883, 'the pollen and fragments of the petals of CLOVER made about sixty per cent. of the food.'
1886. HUNT, THOS. F. *Diabrotica longicornis*. Misc. Essays Ec. Ent., Springfield, Ill., 1886, pp. 103-105.
Bibliographical record; twenty-three entries.

58. THE TWELVE SPOTTED LEAF BEETLE. *Diabrotica 12-punctata*, Oliv.

1883. FORBES, S. A. *Diabrotica 12-guttata*. 12th. Rept. St. Ent. Ill., p. 104.
Adult seen feeding on the blossoms of RED CLOVER.

Family TENEBRIONIDÆ.

59. THE MEAL WORM. *Tenebrio molitor*, Fitch.

1882. LINTNER, J. A. *Tenebrio molitor*. Trans. N. Y. St. Agr. Soc. 1881-2, p. 206.
Included in list of Clover insects, with reference to article by Fitch in Trans. N. Y. St. Agr. Soc., v. XIII, p. 376.

Family MELOIDÆ.

60. MACROBASIS UNICOLOR, Kirby.

1882. WEBSTER, F. M. *Macrobasis unicolor*. Am. Nat., v. XII, p. 746.
Notice of injury to CLOVER.

Family OTIORHYNCHIDÆ.

61. GRAPHORRHINUS VADOSUS, Say.

1882. LINTNER, J. A. *Graphorrhinus vadosus*. Trans. N. Y. St. Agr. Soc., v. 32, p. 192;
Ins. Clover Plant, p. 5.
Included in a list of CLOVER insects. Imago said to feed on the leaves.

62. THE IMBRICATED SNOUT BEETLE. *Epicærus imbricatus*, Say.

1823. SAY, THOMAS. *Liparus imbricatus*. Journ. Acad. Nat. Sci. Phil., vol. III, p. 317.
Le Conte ed. Compl. Writings, vol. II, p. 178.
Original description.
1872. RILEY, C. V. *Epicærus imbricatus*. 3rd. Rept. St. Ent. Mo., p. 58, fig. 21.
Adult frequently injures apple and cherry trees, and gooseberry bushes, by gnawing the twigs and fruit. Life-history unknown. Beetle figured.
1883. FORBES, S. A. *Epicærus imbricatus*. 12th. Rept. St. Ent. Ill., p. 104.
Adult feeding on RED CLOVER blossoms at Normal, Ill., in June, 1882.
1886. FORBES, S. A. *Epicærus imbricatus*. Misc. Essays Ec. Ent., Springfield, Ill., 1886, p. 21.
Reported by correspondent to injure pear leaves. Beetles come out of the ground "and may be seen with their heads just sticking out, as if the earth had not been broken above them." From specimens sent, eggs were obtained. Pear leaves were "found stuck together by their opposed surfaces with a closely packed layer of slender white eggs between them."
1886. HUNT, THOS. F. *Epicærus imbricatus*. Misc. Essays Ec. Ent., Springfield, Ill., 1886, p. 108.
Bibliography as a corn insect. Seven entries.
1888. WEED, CLARENCE M. *Epicærus imbricatus*. Prairie Farmer, June 23, 1888.
Specimens received from Cramer, Ill., with accounts of serious injury to potatoes.
1889. WEED, CLARENCE M. *Epicærus imbricatus*. 7th. Rept. Ohio Agr. Expt. Station, 1888, pp. 167-168; fig. 9.
Discussion of injury to potato, and literature concerning it.

Family CURCULIONIDÆ.

63. SITONES LINEELLUS, Gyll.

1882. LINTNER, J. A. *Sitones lineellus*. Trans. N. Y. St. Agr. Soc., 1881-2, p. 206.
Included in list of CLOVER insects on authority of European authors.

64. SITONES FLAVESCENS. Marsh.

1882. LINTNER, J. A. *Sitones flavescens*. Trans. N. Y. St. Agr. Soc., 1881-2, p. 206.
Included in a list of CLOVER insects on authority of Kalténbach and other European authors.

65. SITONES HISPIDULUS, Germ.

1889. SCHWARZ, E. A. *Sitones hispidulus*. Insect Life, v. II, p. 123.

In report of meeting of Entomological Society of Washington by C. L. Marlatt, acting Recording Secretary occurs the following: "Mr. Schwarz read a note on the spread of *Sitones hispidulus*, a European CLOVER insect which has probably been recently imported. Its sudden appearance in great numbers in Washington, and the likelihood of its becoming a dangerous enemy to Clover in this country were discussed."

66. THE PUNCTURED CLOVER LEAF WEEVIL. *Phytonomus punctatus*, Fabr.

1755. FABRICIUS. *Curculio punctatus*. Syst. Ent., p. 150, no. 119.
Original description.
1781. FABRICIUS. *Curculio punctatus*. Sp. Ins., v. I, p. 190, no. 166.
1787. FABRICIUS. *Curculio punctatus*. Mant. Ins., v. I, p. 117, no. 221.
1790. OLIVIER. *Curculio punctatus*. Enc. Meth., v. V, p. 541, no. 315.
Description.
1801. FABRICIUS. *Curculio punctatus*. Syst. Eleuth., v. II, p. 529, no. 133.
Description and bibliographical references. Inhabits Switzerland.
1876. LE CONTE, JOHN L. *Phytonomus opinus*. Proc. Am. Phil. Soc., v. XV, p. 24.
Described as a new species.
1881. LE CONTE, JOHN L. *Phytonomus punctatus*. Monthly Proc. Ent. Sect. Acad. Nat. Sci. Phila., Oct. 1881, p. XXXVI.
P. opinus Lec. identical with *P. punctatus*.
1881. LINTNER, J. A. *Phytonomus punctatus*. Elmira Husbandman, 14 Sept., 1881.
Appearance in CLOVER fields of New York.
1881. LINTNER, J. A. *Phytonomus punctatus*. Count. Gent., v. XLVI, p. 647.
Introduction into New York; injuries, description, etc.
1881. RILEY, C. V. *Phytonomus punctatus*. Am. Nat., v. XV, pp. 751, 913.
Discovery in New York. Discussion of allied species, and life-history.
1882. RILEY, C. V. *Phytonomus punctatus*. Am. Nat., v. XVI, p. 248.
Statement that *P. opinus* Lec. is a synonym.
1882. RILEY, C. V. *Phytonomus punctatus*. Rept. U. S. Dept. Agr., 1881, pp. 171-179, pl. 10, f. 1.
An elaborate article discussing the insect under the following sub-heads: Habits of the Genus; History of the Species in North America; Life-history of the species; Number of Annual Broods; Remedies; Natural Enemies; Description of Earlier States.

1882. LINTNER, J. A. *Phytonomus punctatus*. 1st Ann. Rept. on Inj. and Other Ins., N. Y., pp. 247-253; f. 73-75.
A lengthy discussion of the species under the following sub-heads: Description of the Beetle; The Cocoon; Not previously known as a CLOVER Pest; Its First Notice; Life-history of the Species; Possibly not lately Imported; Distribution; Remedies.
1884. KILMAN, A. H. *Phytonomus punctatus*. 15th Rept. Ent. Soc. Ont., p. 32.
Beetles found in Ridgway, Ont. Wafted across the lake by a strong wind in August.
1886. ARTHUR, J. C. *Phytonomus punctatus*. 4th Ann. Rept. N. Y. Agr. Exp. Sta., pp. 258-262; figs. 7-10.
Account of a fungous disease of the larvæ of *P. punctatus*, a species of *Entomophora* to which the author gives the name *phytonomi*.
THUR, J. C. *Phytonomus punctatus*. 5th Ann. Rept. N. Y. Agr. Exp. Sta., p. 291; fig. 5.
Larvæ affected with *Entomophora phytomi* found in spring of 1886. Believes that no resting spores are developed but that the fungus hibernates as mycelium in bodies of living larvæ.
1887. COOK, A. J. *Phytonomus punctatus*. Beal's Grasses North America, v. I, pp. 380-383; fig. 140.
Bibliography. History in America. Found in New York and Ontario. Account of life-history. Beetles and larvæ feed on all kinds of CLOVER, Red, White, and Alsike, former being most voracious. Suggests plowing under of infested fields in May.

Family CALANDRIDÆ.

67. SPHENOPHORUS PLACIDUS, Say.

1863. GLOVER, T. *Epicaerus fallax*. Rept. U. S. Dept. Agr., 1863, p. 573.
Very injurious in vicinity of Washington to leaves of young Cabbage, CLOVER and various other plants.

Family SCOLYTIDÆ.

68. THE CLOVER ROOT BORER. *Hylastes trifolii*, Müll.

1879. RILEY, C. V. *Hylesinus trifolii*. Report U. S. Dept. Agr., 1878, pp. 248-250, pl. V, figs. 2, 3.
Received from Western New York, where great damage had been done. A new enemy to American agriculture. Review of European literature. Comparison with *H. opaculus*; and description of larva and pupa. Telephorid larva, apparently *Telephorus bilineatus*, preys upon larvæ. "No other mode of prevention suggests itself to my mind than the plowing under of the CLOVER in the spring of the second year."
1880. RILEY, C. V. *Hylesinus trifolii*. Am. Ent., v. III, p. 180; fig.
Specimen received from Ithaca, N. Y., identified as this species.
1880. LINTNER, J. A. *Hylastes trifolii*. Rept. N. Y. St. Agr. Soc. 1879, pp. 41-42; fig. [Not seen.]

1882. SAUNDERS, WM. *Hylastes trifolii*. Rept. Ent. Soc. Ont., 1881, pp. 43-44; fig. 15. Account of life-history, mostly after Riley, under the following heads: How and where the egg is deposited; The larva or grub; The pupa or chrysalis; Localities infested: Remedies.
1882. LINTNER, J. A. *Hylastes trifolii*. 1st Rept. on Inj. and other Ins. N. Y., p. 54. Thinks gas lime a good remedy.
1883. LINTNER, J. A. *Hylastes trifolii*. Rept. N. Y. St. Agr. Soc., 1882, p. 193; fig. 1. Ins. Clover Plant, pp. 6-9. Bibliography with account of life-history and remedies.
1887. COOK, A. J. *Hylastes trifolii*. Beal's Grasses of North America, v. I, pp. 375-378; fig. 138. Bibliography. History in America; life-history, and remarks on remedies. Figure from Riley.

ORDER HEMIPTERA.

Family PHYTOCORIDÆ.

69. THE FOUR LINED LEAF BUG. *Pecilocapsus lineatus*, Fabr.

1798. FABRICIUS. *Lygaeus lineatus*. Ent. Syst., Suppl., p. 541; No. 324. Original description.
1801. FABRICIUS. *Lygaeus lineatus*. Syst. Rhyng., p. 234, No. 152. Description.
1832. SAY, THOS. *Capsus 4-vittatus*. Heterop.-Hemiptera. p. 20. Reprinted in Trans. N. Y. St. Agr. Soc., 1857, v. XVII, p. 784, and in Compl. Writings, v. I, p. 339. Described as new.
1833. LINTNER, J. A. *Pecilocapsus lineatus*. 1st. Rept. on Inj. and other Ins., N. Y., pp. 271-281, f. 78. An elaborate article discussing the bibliography, injuries, food-plants, life-history, distribution, remedies and preventives. Food-plants include: Red and Black Currant, CLOVER, Morning-glory, Phlox, Chrysanthemum, Pinks, Geranium, Day-lily, London-pride, Sweet Pea, Raspberry, Bittersweet, Wiegelia, Burning Bush, Sumach, Dahlia, Snap-dragon, Soapwort, Tansy, Parsnip, Lettuce, Pea, Radish, Squash, Cucumber and Gooseberry.
1887. LINTNER, J. A. *Pecilocapsus lineatus*. Count. Gent., v. LII, p. 517; 14 July, 1887; abstract in 4th Rept. on Ins. N. Y. 1888, p. 200. Insects infesting currant bushes at Fairmount, N. Y., are *Pecilocapsus lineatus* (Fabr). Description of it is given and of its method of injury. It cannot be killed by application to the leaves, as it is a suctorial insect. Remedies are burning refuse garden materials where it hibernates, killing the hibernating female when returning to the bushes in early spring for oviposition, and beating the larva and pupa into a pan of water and kerosene (Lintner).

Family COCCIDÆ.

70. THE CLOVER BARK LOUSE. *Coccus trifolii*, Forbes.

1885. FORBES, S. A. *Coccus trifolii*. 14th Rept. St. Ent. Ill., pp. 72-73.

A root coccid found on roots WHITE CLOVER, accompanied by an ant (*Lasius*) in May, is described under above name as new.

71. THE MAPLE BARK LOUSE. *Pulvinaria innumerabilis*, Rathv.

1887. COOK, A. J. *Pulvinaria innumerabilis*. Beal's Grasses of North America, v. I, p. 374.

Observed on CLOVER.

72. THE LINDEN BARK LOUSE. *Lecanium tiliae*, Fitch.

1887. COOK, A. J. *Lecanium tiliae*. Beal's Grasses of North America, v. I, p. 374.

Observed on CLOVER.

Family THRIPIDÆ.

73. THE WHEAT THRIPS. *Thrips tritici*, Fitch.

1855. FITCH, ASA. *Thrips tritici*. Country Gentlemen, v. VI, p. 385; 13 Dec., 1855.

Specimens sent from Geneva, Wisconsin, as injuring the blossoms of Wheat and CLOVER early in July; characters of the Thripidæ given; their numerous food plants; abundance, habits and injuries of the Grain Thrips, *Thrips cerealium*, in England. The several stages of the Wisconsin species are described, and it is named *Thrips tritici* (Lintner).

1888. OSBORN, HERBERT. *Thrips tritici*. Insect life, v. I, pp. 140-141.

Notes on presence in CLOVER heads, and probability that the Thrips subsist on tissues of the clover.

ORDER ORTHOPTERA.

Family ACRIDIDÆ.

74. THE LESSER MIGRATORY LOCUST. *Caloptenus atlantis*, Riley.

1875. RILEY, C. V. *Caloptenus atlantis*. 7th Rept. St. Ent. Mo., p. 169-170.

Original description.

1884. RILEY, C. V. *Caloptenus atlantis*. Rept. U. S. Dept. Agr., 1883, pp. 170-180; pl. II.

Extended discussion of the insect under the following heads: Ravages in the Merrimac Valley, New Hampshire; Historical; Characters; Range and Life-history; Natural Enemies; Remedies. Devours CLOVER, Oats, grasses and Corn.

1886. HUNT, THOS. F. *Pezotettix atlantis*. Misc. Essays Ec. Ent., Springfield, Ill., 1886. p. 120.

Bibliography as a corn insect; five entries.

75. THE RED-LEGGED LOCUST. *Caloptenus femur-rubrum*, De G.

1773. DE GEER, CARL. *Acridium femur-rubrum*. Mem. pour Serv., p. 498; pl. 42, f. 5. Original description.
1842. HARRIS, T. W. *Acridium femur-rubrum*. Ins. Inj. to Veg., 1st ed., pp. 137-138; Injuries in meadows, with extract from article by President Dwight, discussing ravages. Favorite food is CLOVER and Maize. Notes on habits and life-history.
1886. WEED, CLARENCE M. *Pezotettix femur-rubrum*. Misc. Essays Ec. Ent., pp. 48-56, Injuries in Northern Illinois with account of investigations of egg enemies, etc. CLOVER and other crops severely injured.
1886. HUNT, THOS. F. *Pezotettix femur-rubrum*. Misc. Ess. Ec. Ent., p. 119. Bibliography as a corn insect; fifteen entries.

76. THE ROCKY MOUNTAIN LOCUST. *Caloptenus spretus*, Thomas.

1877. RILEY, PACKARD AND THOMAS. *Caloptenus spretus*. First Ann. Rept. U. S. Entom. Commission. Elaborate discussion of injuries, life-history and remedies.

77. THE TWO-STRIPED LOCUST. *Caloptenus bivittatus*, Say.

1826. SAY, THOS. *Gryllus bivittatus*. Journ. Acad. Nat. Sci. Phila., v. IV, pp. 308-309 Compl. Writings, v. II, pp. 237-238. Original description.
1862. HARRIS, T. W. *Acrydium flavo-vittatum*. Ins. Inj. Veg., 2nd ed., pp. 140-141; 3rd ed., pp. 173-174. Described as a new species. Said to differ from *A. bivittatus*, Say. Very troublesome in gardens. Young appear in June and become adult in August.
1835. BURMEISTER. *Acridum femoratus*. Handb. Ent., v. II. p. 368. Described as new.
1862. UHLER, P. R. *Caloptenus bivittatus*. Harris Ins. Inj. Veg., 3rd ed., pp. 173-174, footnote. States that *A. flavo-vittatum* is the same as Say's *A. bivittatus*, Burmeister's *A. femoratus*, and *A. miferti*, Serv.
1875. THOMAS, CYRUS. *Caloptenus bivittatus*. U. S. Geog. Surv., v. V, p. 894. Bibliography. Many specimens captured in the far west.
1879. THOMAS, CYRUS. *Caloptenus bivittatus*. 9th Rept. St. Ent. Ill., pp. 126-127. Extended description. Common throughout Illinois.
1886. GODING, F. W. *Pezotettix bivittatus*. Misc. Ess. Ec. Ent., Springfield, Ill., 1886, p. 127. Injuries of this and two closely allied species in Livingston county, Ill., 1885.

78. THE COMMON YELLOW MEADOW LOCUST. *Caloptenus differentialis*, Thos.

1865. THOMAS, CYRUS. *Acridium differentialis*. Trans. Ill. St. Bd. Agr., v. V, p. 450. Original description.

1886. WEED, CLARENCE M. *Pesotettix differentialis*. Misc. Ess. Ec. Ent., Springfield, 1886, pp. 48-56.
 Notes on an outbreak of indigenous locusts in Central Illinois in 1884-5. Great damage done in many localities, especially to CLOVER. Account of abundance of enemies to the eggs; methods of destroying young grasshoppers, and probabilities of future injury.
1886. HUNT, THOS. F. *Pesotettix differentialis*. Misc. Ess. Ec. Ent., Springfield, Ill., 1886, p. 122.
 Bibliography as a corn insect; ten entries.

ORDER NEUROPTERA.

Family PODURIDÆ.

79. THE GARDEN FLEA. *Smythurus hortensis*, Fitch.
1863. FITCH, ASA. *Smythurus hortensis*. 8th Rept. on Nox. and other Ins. N. Y., Trans. N. Y. St. Agr. Soc. 1862, pp. 668-673.
 Described for first time. Very abundant in gardens, especially in spring. Five varieties noticed. Said to sometimes abound in CLOVER fields. Long account of habits.
80. THE FIELD FLEA. *Smythurus arvalis*, Fitch.
1863. FITCH, ASA. *Smythurus arvalis*. 8th Rept. on Nox. and other Ins. N. Y., Trans. N. Y. St. Agr. Soc., 1862, pp. 673-674.
 Described for first time. Often very abundant, especially in CLOVER fields. Account of habits.

ORDER ACARINA.

81. THE CLOVER MITE. *Bryobia pratensis*, Garman.
1885. GARMAN, H. *Bryobia pratensis*. 14th Rept. St. Ent. Ill., p. 73; pl. VI, fig. 7.
 A large brownish-red mite noticed in May "on CLOVER and blue grass, the former of these plants especially, sometimes suffering severely from the pest" is described as new under above name. "The leaves of the CLOVER turned yellow and their growth was arrested where the mite was abundant."
82. THE PALE CLOVER MITE. *Bryobia pallida*, Garman.
1885. GARMAN, H. *Bryobia pallida*. 14th Rept. St. Ent. Ill., p. 74.
 Found in company with *B. pratensis* on CLOVER and grasses at Normal, Ill., in May, 1884. Described as new.

PART II. SYSTEMATIC LIST OF CLOVER INSECTS.

ORDER LEPIDOPTERA.

Family PAPILIONIDÆ.

1. *Callidryas eubule*, Linn.
2. *Colias caesonias*, Stöhl.
3. *Colias euryheme*, Bd.
4. *Colias philodice*, Godt.
5. *Terias nicippe*, Cram.
6. *Terias lisa*, Bd.
7. *Terias delia*, Cram.

Family NYMPHALIDÆ.

8. *Melitea editha*, Bd.

Family LYCAENIDÆ.

9. *Chrysophanus americana*, D'Urb.
10. *Lycaena comyntas*, Godt.

Family HESPERIDÆ.

11. *Eudamus pylades*, Scudd.

Family BOMBYCIDÆ.

12. *Arctia achaia*, Gr.-Robs.
13. *Arctia phalerata*, Harr.
14. *Pyrrharctia isabella*, Sm.-Abb.
15. *Hyphantria cunea*, Drury.
16. *Hyperchiria io*, Fabr.

Family NOCTUIDÆ.

17. *Agrotis malefida*, Guen.
18. *Agrotis fennica*, Tausch.
19. *Agrotis annexa*, Treitsch.
20. *Agrotis saucia*, Hübn.

21. *Mamestra trifolii*, Esp.
22. *Mamestra renigera*, Steph.
23. *Mamestra picta*, Harr.
24. *Prodenia commelinae*, Sm.—Abb.
25. *Nephelodes violans*, Guen.
26. *Heliophila unipuncta*, Haw.
27. *Plusia brassicae*, Riley.
28. *Heliothis armigera*, Hübn.
29. *Drasteria erectea*, Cram.
30. *Hypena scabra*, Fabr.

Family GEOMETRIDAE.

31. *Haematopsis grataria*, Fabr.
32. *Aspilates dissimilaria*, Hübn.
33. *Cymatophora crepuscularia*, Tr.
34. *Eupithesia interruptofasciata*, Pack.

Family PYRALIDAE.

35. *Asopia farinalis*, Linn.
36. *Asopia costalis*, Fabr.
37. *Asopia olinalis*, Guen.
38. *Tetralopha*, n. sp., Lintner.
39. *Ephestia interpunctella*, Hübn.

Family TORTRICIDAE.

40. *Cacœcia rosaceana*, Harr.
41. *Lophoderus triferana*, Walk.
42. *Tortrix pallorana*, Rob.
43. *Dichelia sulphureana*, Clem.
44. *Amphisa discopunctana*, Clem.
45. *Platynota flavedana*, Clem.
46. *Sericoris instrutana*, Clem.
47. *Phoxopteris angulifasciana*, Zell.
48. *Grapholitha interstinctana*, Clem.

Family TINEIDAE.

49. *Gelechia roseosuffusella*, Clem.
50. *Anaphora agrotipennella*, Grote.

ORDER DIPTERA.

Family OSCINIDAE.

51. *Oscinis trifolii*, Burg.

Family CECIDOMYIDAE.

52. *Cecidomyia leguminicola*, Lint.
53. *Cecidomyia trifolii*, Lœw.

ORDER COLEOPTERA.

Family EROTYLIDAE.

54. *Languria mozardi*, Latr.

Family SCARABEIDAE.

55. *Lachnosterna serricornis*, Le C.

Family CHRYSOMELIDAE.

56. *Colaspis brunnea*, Fabr.
57. *Diabrotica longicornis*, Say.
58. *Diabrotica 12-punctata*, Oliv.
59. *Tenebrio molitor*, Fitch.

Family MELOIDAE.

60. *Macrobasis unicolor*, Kirby.

Family OTIORHYNCHIDAE.

61. *Graphorrhinus vadosus*, Say.
Epicaerus imbricatus, Say.

Family CURCULIONIDAE.

63. *Sitones lineellus*, Gyll.
 flavescens, Marsh.
65. *Sitones hispidulus*, Germ.
66. *Phytonomus punctatus*, Fabr.

Family CALANDRIDAE.

67. *Sphenophorus placidus*, Say.

Family SCOLYTIDÆ.

68. *Hylastes trifolii*, Müll.

ORDER HEMIPTERA.

Family PHYTCORIDÆ.

69. *Poecilocapsus lineatus*, Fabr.

Family COCCIDÆ.

70. *Coccus trifolii*, Forbes.
71. *Pulvinaria innumerabilis*, Rathv.
72. *Lecanium tiliae*, Fitch.

Family THRIPIDÆ.

73. *Thrips tritici*, Fitch.

ORDER ORTHOPTERA.

Family ACRIDIDÆ.

74. *Caloptenus atlanis*, Riley.
75. *Caloptenus femur-rubrum*, DeG.
76. *Caloptenus spretus*, Thos.
77. *Caloptenus bivittatus*, Say.
78. *Caloptenus differentialis*, Thos.

ORDER NEUROPTERA.

Family PODURIDÆ.

79. *Smynthurus hortensis*, Fitch.
80. *Smynthurus arvalis*, Fitch.

ORDER ACARINA.

81. *Bryobia pratensis*, Garman.
82. *Bryobia pallida*, Garman.

EXPLANATION OF PLATES.

A straight line at the right of a figure indicates the natural size of the specimen. The plates are photo-engravings made from drawings prepared, under my supervision, by my assistant, Miss Freda Detmers. C. M. W.

PLATE I. (Original).

- Fig. 1. The 20-Spotted Lady-Beetle (*Psephenus 20-maculata*, Say).
a. Larva. Enlarged.
b. Pupa. "
c. Imago. "
Fig. 2. The Larger Typha Borer. (*Arzama obliquata* G. & R.)
a. Larva. Enlarged.
b. Antenna of larva. Enlarged.
c. Pupa. Enlarged.
d. Imago. Natural size.
Fig. 3. The Toothed-horned Fish-Fly. (*Chauliodes rastricornis*, Ramb).
a. Larva. Natural size.
b. Pupa. "
c. Imago, male "
d. Imago, female "

PLATE II. (Original).

- Fig. 1. The Sagittaria Curculio. (*Listronotus latiusculus*, Boh).
a. Larva. Enlarged.
b. Pupa, ventral view. Enlarged.
c. Pupa, dorsal view. Enlarged.
d. Imago. Enlarged.
Fig. 2. The Lesser Water-Bug. (*Zethenia fluminea*). Natural size.
Fig. 3. The Undulating Back-Swimmer. (*Notonecta undulata*). Enlarged.
Fig. 4. An Aquatic Leaf-Beetle. (*Donacia subtilis*). Enlarged.
Fig. 5. The Aquatic Lady-bird. (*Hippodamia 13-punctata*).
a. Pupa. Enlarged.
b. Imago. Enlarged.
Fig. 6. Eggs of *Benacus griseus*. Natural size.
Fig. 7. The Giant Water Bug. (*Belostomatidae americanum*). Natural size.

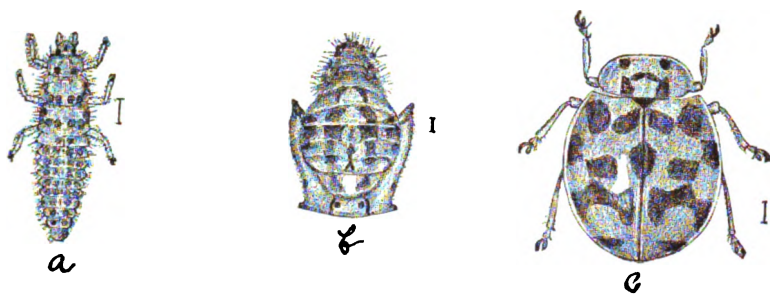


Fig. 1.

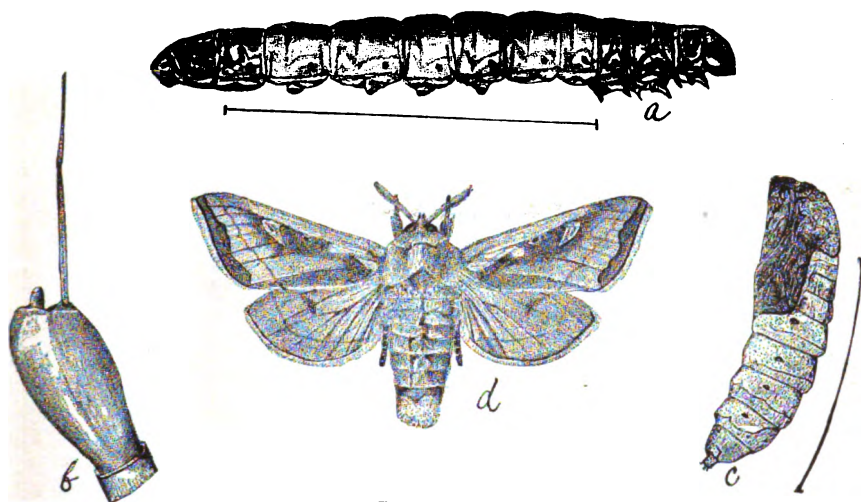


Fig. 2.

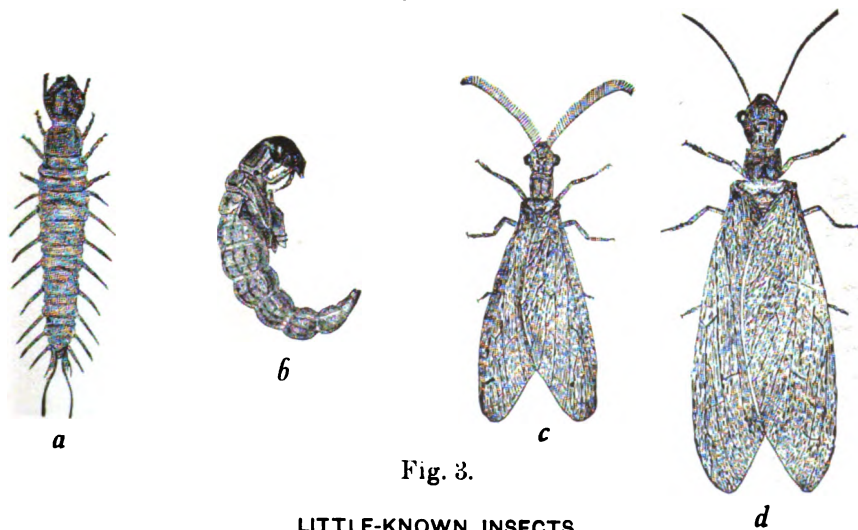


Fig. 3.

LITTLE-KNOWN INSECTS.

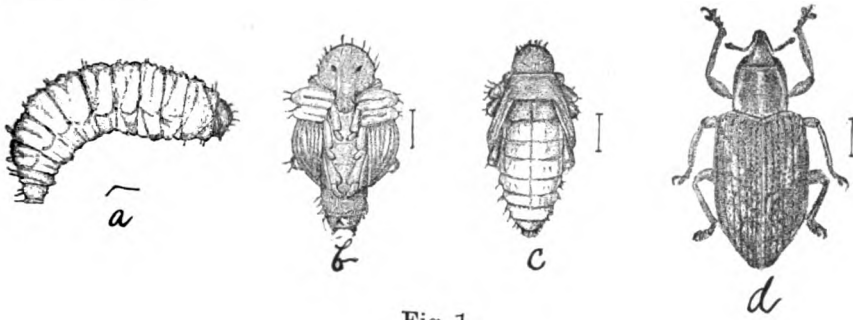


Fig. 1.



Fig. 2.



Fig. 3.



Fig. 4.

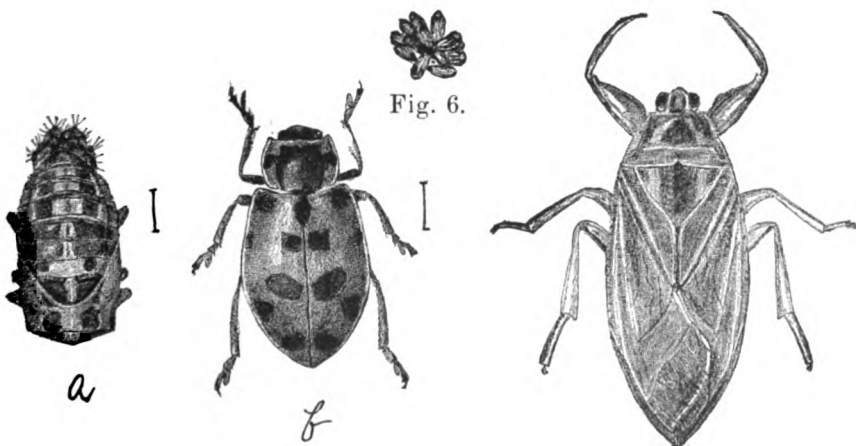


Fig. 5.



Fig. 6.

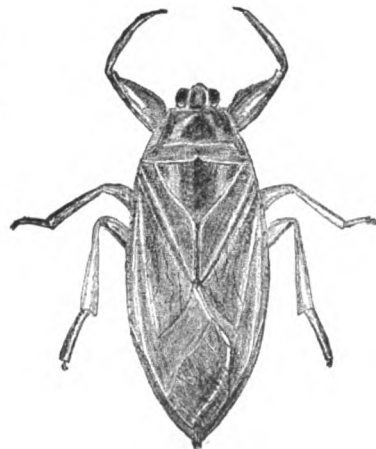


Fig. 7.

AQUATIC INSECTS.

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BULLETIN

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OF THE

Ohio Agricultural Experiment Station.

TECHNICAL SERIES.—VOLUME I, NUMBER 2.

MAY, 1890.

ARTICLE IV. FLOWERING PLANTS ON GROUNDS OF THE OHIO STATE UNIVERSITY.

ARTICLE V. FOURTH CONTRIBUTION TO LIFE HISTORY OF LITTLE KNOWN PLANT-LICE.

ARTICLE VI. DESCRIPTIVE CATALOGUE OF THE SHELLS OF FRANKLIN COUNTY, OHIO.

COLUMBUS:

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5

COMPLIMENTS OF

CLARENCE M. WEED.

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Offices and Experiment Grounds on the Farm of the Ohio State University.

The Bulletin of this Station is sent free to all residents of the State who request it. Persons who receive duplicate copies of the Bulletin, or who do not care to receive any, are requested to notify the Station, as the edition is not sufficient to supply the urgent demand for it.

All correspondence should be addressed to EXPERIMENT STATION, Columbus, Ohio.

COLUMBUS:

THE WESTBOTE COMPANY, STATE PRINTERS.
1890.

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NOTICE.

At a recent meeting of the Board of Control of this Station the Division of Entomology and Botany was authorized to undertake a systematic study of the animals and plants of the State to serve as a surer basis of knowledge than is now possessed for the prosecution of the distinctively economic work. It is designed to study so far as possible the flora and fauna of the State as an organic whole, and especially as they relate to our agricultural interests. Collections of animals and plants will be made in different parts of the State, and as fast as material accumulates and time permits descriptive and biological papers will be published in this series of the Station's Bulletin.

As a natural outgrowth of this natural history survey, in the course of which it will be necessary to collect a great number of duplicate specimens, it is proposed to distribute sets of such insects and plants as are of special economic interest to those granges, horticultural societies, and farmers' clubs, that desire them; and also eventually to make similar distributions to the township high schools of the State.

BULLETIN

OF THE

OHIO AGRICULTURAL EXPERIMENT STATION.

VOL. I, No. 2.

TECHNICAL SERIES.

MAY, 1890.

ARTICLE IV. A CATALOGUE OF THE UNCULTIVATED FLOWERING PLANTS GROWING ON THE OHIO STATE UNIVERSITY GROUNDS.*

BY MOSES CRAIG, B. Sc.

INTRODUCTION.

In the fall of 1888 I chose as my thesis work the making of a catalogue of the uncultivated flowering plants growing on the grounds of the Ohio State University. I had already on hand notes and observations extending over a period of nearly six years, which were made on pleasure excursions and when collecting for classes at the University. At that time, however, there was no expectation of using them for this purpose, my object being to obtain material for a future flora of the county; so in order to give the catalogue the requisite accuracy and completeness it was necessary to revise and extend these notes by more field work. I accordingly devoted such time as I could spare during the fall and spring to a careful examination of the localities mentioned by former students, and to a diligent search in every portion of the farm for species not previously noticed.

I do not doubt that further investigations will somewhat increase the number of species here recorded, for in the short time at my disposal it

*Thesis presented to the Faculty of the Ohio State University for the degree of Bachelor of Science, June 19, 1889.

PREPARATORY NOTE.—This catalogue which is intended to be more than its title indicates should perhaps have been called "A Catalogue of Uncultivated Phanogams with Notes on their Abundance, Distribution and Time of Blooming." The character of the soil and climate has also been commented on in an endeavor to assist collectors in their work.

That these notes may prove of some value to future students in Botany at the University is the wish of the writer.

would be impossible to make a complete enumeration of these plants, although no effort has been spared to accomplish this end. Several of the orders are not fully worked up; this is especially true of the aquatic plants; and in some of the more difficult genera of Cyperaceæ, Juncaceæ and Graminæ there must be more or less numerous omissions, yet it is probable that no species really characteristic of our flora has been overlooked. As an aid in making the list complete I have consulted the observations recorded by students, and made some use of the University herbarium and the localities there mentioned; these notes and references, however, were few in number and whenever use has been made of them due acknowledgment appears in the list.

In order to render the catalogue of more value and to give more certainty to my determinations I have quoted several authorities for the situation of all except our commonest plants, but unless the contrary is expressly stated I have personally collected and examined specimens from the localities mentioned. I have specimens in my herbarium of nearly all the species named in the following list.

It is hoped that students of Botany will look for plants not mentioned in this list in order to supply its deficiencies and pave the way for a more complete catalogue in the future. Such a list would be very useful to botanical collectors and to students pursuing the study of Botany at the University.

LIMITS OF THE FLORA AND ITS PHYSICAL CHARACTERS.

As this catalogue is intended to include all the uncultivated flowering plants found on the University farm it may not be amiss to say a few words about its location and extent.

This farm, consisting of about 320 acres, is situated within the corporate limits of Columbus, Franklin county, and about three miles north of the State house. It lies between North High street and the Olentangy River, and is bounded on the north by Woodruff avenue, on the south by Woodward avenue and a small lane running from Neil avenue to the river. Its greatest dimensions are 4600 feet from east to west, and 3500 feet from north to south.

About 40 acres in the central part are reserved for a campus; the remainder is cultivated by the Experiment Station, or used for pasture, except a wood lot of fifteen acres in the northeast corner and a narrow belt of woods along the river and around the island where, as is shown in the catalogue, most of our rarer plants are found. The ground has a more or less undulating surface and through it flows a small stream—Neil's Run—whose banks are lined with willows and other native shrubs.

What is now called the island was originally completely surrounded

by water, but in 1880 a dike was built along the north line of the farm and continued along the west side, thus protecting the low lands which before were flooded whenever there was high water. The lower portions of the river bed cut off by this levee still remain covered by water, a system of ponds and swamps separating the "island" from the rest of the farm except where a path on the north dike and a road on the south side enter it. This river improvement increased the area of the farm twelve acres and protected twelve more from the annual overflows and freshets.

In the winter and spring of 1887 the island was cleared off, nine acres being thus brought into cultivation. The flora has been greatly changed in the last few years on this account; plants abundant there six or seven years ago are now very rare or have entirely disappeared as the land was gradually brought under cultivation.

The flora of the woods has also suffered, but in a different way; the ground has been drained, the underbrush removed, and cattle have been permitted to pasture there; this, as all botanists know, is fatal to delicate plants. Last summer the woods were separated from the pasture by a fence on the east side which protects it from farther damage, and it is wonderful how quickly our rarer plants are beginning to re-appear. This spring I was agreeably surprised to find specimens of *Trillium grandiflorum*, *T. erectum*, and *T. declinatum* growing luxuriantly, with *Scilla*, *Hydrastis*, *Delphinium* and other rare plants, which had disappeared years before and which we had no hopes of ever finding again within our limits.

GEOLOGY OF THE FARM.

The geology of the farm in its relation to the flora demands some attention. It is a limestone formation, the corniferous limestone being overlaid by the Olentangy shales and the drift. In consequence of this there is an entire absence of *Ericaceæ*, no representatives of this family having been found within twelve miles of the city. In their place we find the beech, elm, hickory, yellow locust, walnut, white oak and sugar maple, with other plants common to the clays and limestones, while the sycamore, hackberry and willow grow in the richer soils nearer the river.

The principal soils are gravel, clay, loam and peat. In the Olentangy valley are rich alluvial bottom lands which bear large crops, but where not cultivated the ground is covered with a dense jungle of *Ambrosia*, *Helianthus*, *Eupatorium* and other members of *Compositæ*, with other plants such as *Impatiens*, *Urtica*, *Heracleum* and *Desmodium*.

NOTES ON THE CLIMATE.

The abruptness and magnitude of temperature variations exert a more important influence upon the vegetable life of a place than does the actual mean temperature. Hence the climate should be estimated more by the daily range of the thermometer than by its average height.

It has been said that "the climate of Ohio is capricious and one of extremes—due to its geographical position and topographical features" and "that the rainfall is quite variable." Columbus, fortunately, is free from high winds and extreme temperatures, its climate being characterized by variableness rather than severity. The mean annual temperature from observations taken at the University during the last six years is 48.3 degrees; the highest temperature 102.5 degrees, and the lowest 32 degrees below zero, giving a range of 134.5 degrees; the greatest daily range of temperature during this period was 55 degrees.

The average annual rainfall is about 38 inches, though the normal is 40 inches. In 1883, a wet year, it was 46.37 inches, and in the dry year of 1887 it was 36.62 inches. Our heaviest rains are usually in May and December, and the lightest in August and October.

EXTENT AND BEAUTY OF OUR FLORA.

Our flora presents few plants that may be called uncommon in central Ohio, yet it furnishes a rich field for collectors, as probably no tract of land in its vicinity of such limited area can be found exhibiting so large a number of species or including so many orders.

Its beauty depends not only on its great variety of plants, but also on the abundance in which they are produced. There was a time not long ago when many beautiful plants were common on the island and in the woods which are not now found there, and it is probable that several orchidaceous and other rare plants once bloomed profusely in the damp woods and rich meadows along the river. Within the last six years the large flowered trillium and the orchids have gone, and the larkspur, lungwort and squill are fast going.

I fear the same fate awaits many other plants which do much to beautify our grounds, and to prevent this I suggest that pains be taken to re-establish upon the farm the many attractive plants which it has lost. The effort is sure to succeed—it would cause but little expense and would greatly increase the pleasure of a visit to the grounds. There is really no reason why all the plants of the county should not be represented here. Among the plants that have entirely disappeared may be mentioned the *Orchis* and *Cypripedium* which delight in thick, moist woods, and the Canadian violet formerly so abundant on the island.

TIME OF BLOOMING OF PLANTS.

I have kept for several years a careful record of the dates on which our common plants come into bloom, and thinking that these notes may be of interest in connection with this catalogue I have inserted them in

their proper place. It was my intention at first to put them in tabular form, but there were several difficulties in the way, one of which was the size of the page required, and another the unnecessary room that would be taken up by a chart where all the spaces are not filled; so I adopted the present method of placing the date after the name in the list.

In the fall of 1887 I made some notes on the number of plants in bloom on the farm during the different months, beginning in September and continuing the observations to the end of the year. The results are shown in the following table:

PLANTS IN BLOOM ON THE UNIVERSITY FARM DURING THE FALL OF 1887.

Hedge Mustard (<i>Sisymbrium officinalis</i> , Scop.).....	September.
Black Mustard (<i>Brassica nigra</i> , L.).....	September and October.
Field Mustard (<i>Brassica arvensis</i> , L.).....	September.
Shepherd's Purse (<i>Capsella Bursa-pastoris</i> , Moench).....	September, October and November.
Peppergrass (<i>Lepidium Virginicum</i> , L.).....	September, October and November.
Chickweed (<i>Stellaria media</i> , Smith.).....	September and December.
Low Mallow (<i>Malva rotundifolia</i> , L.).....	September, October and November.
Sida (<i>Sida spinosa</i> , L.).....	September and October.
Indian Mallow (<i>Abutilon avicennæ</i> , Gaertn.).....	September and October.
Wood sorrel (<i>Oxalis corniculata</i> , L. var. <i>stricta</i> , Sav.).....	September and October.
Touch-me-not (<i>Impatiens fulva</i> , Nutt.).....	September.
White Clover (<i>Trifolium repens</i> , L.).....	September.
Red Clover (<i>T. pratense</i> , L.).....	September and October.
Bouncing Bet (<i>Saponaria officinalis</i> , L.).....	October.
Purslane (<i>Portulaca oleracea</i> , L.).....	October.
Yellow Melilot (<i>Melilotus officinalis</i> , Willd.).....	September.
Sweet-scented Clover (<i>M. alba</i> , Lam.).....	September and October.
Bladder Senna (<i>Coleutea arborescens</i> , L.).....	September and October.
Cinquefoil (<i>Potentilla Norvegica</i> , L.).....	October.
Cinquefoil (<i>P. recta</i> , Willd.).....	October.
Evening Primrose (<i>Oenothera biennis</i> , L.).....	October.
Wild Parsnip (<i>Pastinaca sativa</i> , L.).....	October.
Sweet Sicily (<i>Osmorrhiza brevistylis</i> , D. C.).....	October.
Teasel (<i>Dipsacus sylvestris</i> , Mell.).....	September.
Iron Weed (<i>Vernonia Novaboracensis</i> , Willd.).....	September and October.
Aster (<i>A. cordifolius</i> , L.).....	September and October.
New England Aster (<i>A. Nova-Angliæ</i>).....	September and October.
Aster (<i>A. prenanthoides</i> , Muhl.).....	September and October.
New York Aster (<i>A. Novi-Belgii</i> , L.).....	September and October.
Starved Aster (<i>A. miser</i> , L.).....	September.
White Weed (<i>Erigeron annuus</i> , Per.).....	September and October.
Broad-leaved Goldenrod (<i>Solidago latifolia</i> , Muhl.).....	September and October.
Large Goldenrod (<i>S. gigantea</i> , Ait.).....	September and October.
Boneset (<i>Eupatorium perfoliatum</i> , L.).....	September and October.
White Snake-root (<i>E. ageratoides</i> , L.).....	September and October.
Cup-plant (<i>Silphium perfoliatum</i> , L.).....	September.
Horse Weed (<i>Ambrosia trifida</i> , L.).....	September.
Rag Weed (<i>A. artemisiifolia</i> , L.).....	September.
Clot Weed (<i>Xanthium Canadense</i> , Mill.).....	September.
Sunflower (<i>Helianthus decapetalus</i> , L.).....	September.
Sunflower (<i>H. strumosus</i> , L.).....	September.

Actinomeris (<i>A. squarrosa</i> , Nutt.).....	September and October.
Spanish Needles (<i>Bidens bipinnata</i> , L.)	September.
Burr Marigold (<i>B. chrysanthemoides</i> , Mx.).....	September and October.
American Sneezewort (<i>Helenium autumnale</i> , L.).....	September and October.
May Weed (<i>Anthemis Cotula</i> , D. C.)	September and October.
Yarrow (<i>Achillea Millefolium</i> , L.).....	September and October.
Cudweed (<i>Gnaphalium decurrens</i> , Ives.).....	September.
Fireweed (<i>Erechtites hieracifolia</i> , Rafs.).....	September.
Bull Thistle (<i>Oniscus lanceolatus</i> , Hoffm.).....	September and October.
Burdock (<i>Arctium Lappa</i> , L.).....	September and October.
White Lettuce (<i>Prenanthes alba</i> , L.)	September.
Dandelion (<i>Taraxacum officinale</i> , Weber.).....	September and November.
Wild Lettuce (<i>Lactuca leucophæa</i> , Gray.).....	September and October.
Sow-thistle (<i>Sonchus asper</i> , Vill.)	September.
Great Lobelia (<i>L. syphilitica</i> , L.).....	September and October.
Indian Tobacco (<i>L. inflata</i> , L.).....	October.
Tall Bellwort (<i>Campanula Americana</i> , L.).....	September and October.
Common Plantain (<i>Plantago major</i> , L.).....	September.
Narrow-leaved Plantain (<i>P. lanceolata</i> , L.).....	September.
Common Mullein (<i>Verbascum thapsus</i> , L.).....	September and October.
Moth Mullein (<i>V. Blattaria</i> , L.).....	September.
Toad Flax (<i>Linaria vulgaris</i> , Mill.).....	September and October.
American Speedwell (<i>Veronica Americana</i> , Sch.)	September.
Slender Gerardia (<i>G. tenuifolia</i> , Vahl.).....	September.
Beech-drops (<i>Epiphegus Virginiana</i> , Bart.).....	Came in bloom Oct. 4th.
Vervain (<i>Verbena urticifolia</i> , L.).....	September.
Fog Fruit (<i>Lippia lanceolata</i> , Mx.).....	September.
Peppermint (<i>Mentha piperita</i> , Smith.).....	September.
Pennyroyal (<i>Hedeoma pulegioides</i> , Pers.).....	September.
Catnip (<i>Nepeta Cataria</i> , L.).....	September and October.
Hedge Nettle (<i>Stachys palustris</i> , L.).....	September.
Motherwort (<i>Leonurus Cardiaca</i> , L.).....	September and October.
Spotted Phlox (<i>P. maculata</i> , L.).....	September.
Morning Glory (<i>Pharbitis purpurea</i> , Lam.).....	September and October.
Black Nightshade (<i>Solanum nigrum</i> , L.).....	September.
Bitter-Sweet (<i>S. Dulcamaria</i> , L.).....	September and October.
Strawberry Tomato (<i>Physalis Alkekengi</i> , L.).....	October.
Jimson Weed (<i>Datura Stramonium</i> , L.).....	September and October.
Dock (<i>Rumex obtusifolius</i> , L.).....	September and October.
Mild Water Pepper (<i>Polygonum hydropiperoides</i> , Mx.).....	September and October.
Knot Bindweed (<i>P. Convolvulus</i> , L.).....	September and October.
Bird's Knot Grass (<i>P. aviculare</i> , L.)	September and October.
Hedge Bindweed (<i>P. dumetorum</i> , L.).....	September.
Poke Weed (<i>Pyrolacca decandra</i> , L.).....	September and October.
Pig Weed (<i>Chenopodium album</i> , L.).....	September.
Amaranth (<i>Amaranthus retroflexus</i> , L.).....	September and October.
White Pigweed (<i>A. albus</i> , L.).....	September.
Spurge (<i>Euphorbia hypericifolia</i> , L.).....	September and October.
Spotted Spurge (<i>E. maculata</i> , L.).....	September.
Rich Weed (<i>Pilea pumila</i> , Gr.).....	September.
Wood Nettle (<i>Laportia Canadensis</i> , Gaud.).....	September.
Water Plantain (<i>Alisma plantago</i> , L.).....	September.
Arrow Head (<i>Sagittaria variabilis</i> , Engel.).....	September.
Timothy (<i>Phleum pratense</i> , L.).....	September.

SEPTEMBER.—The total number of species was eighty-six, representing twenty-two different families and sixty-three genera. The number of species of the different orders varied from one to thirty-two, the largest number being in the Compositæ or Sunflower family, which has the honor of having more individual plants in bloom this month than all the other orders taken together. Six families were represented by a single species each; seven families by two species each; three by three species and four by five species each.

The weather during the month was favorable to vegetation as there were only two frosts and these were light, the lowest temperature being 33 degrees on the 26th., while the maximum on the 5th, was 92.5 degrees. The mean temperature was 64.4 degrees, which is about normal. There was but little rain most of which fell toward the close of the month.

OCTOBER.—A glance at the list will show the names of some of our early spring flowers, as the shepherd's purse, chickweed and dandelion. There were fifty-six species in bloom, representing twenty families and forty-seven genera. Twenty species, over a third of the whole number, belong to Compositæ; all of the others are bad weeds.

This was a very dry month, as the rainfall was only 0.38 inch and there was no snow. The mean temperature was 47.9 degrees, the maximum 82 degrees on the 5th, and the minimum 15.5 degrees on the 31st. There were twelve frosts during the month.

PLANTS IN BLOOM, NOVEMBER 1887.

Henbit (<i>Lamium amplexicaule</i> L.).....	April 15th,	November 8th.
Pepper Grass (<i>Lepidium Virginicum</i> L.).....	June 1st,	November 12th.
Dandelion (<i>Taraxicum officinale</i> , Weber.).....	April 11th,	November 16th.
Shepherd's Purse (<i>Capsella Bursa-pastoris</i> , Mench.).....	April 20th,	November 18th.
Low Mallow (<i>Malva rotundifolia</i> , L.).....	May 20th,	November 24th.
Chickweed (<i>Stellaria media</i> , Sm.).....	April 8th,	December 25th.

NOVEMBER.—There were five species in bloom this month, representing four orders and five genera. They all begin to bloom early in the season and are bad weeds. The dates of their first and last appearance in bloom are given in the table for convenience of reference.

The mean temperature for the month was 37.6 degrees and the maximum 71 degrees on the 3d. There were 17 frosts during this month. But little snow fell until the 28th, when there was 6.8 inches on the ground and the next day the mercury dropped to 8 degrees below zero. The ground was bare from the 4th of December until after Christmas day when the common chickweed was in bloom. It seems to bloom at all seasons of the year, for I found specimens in bloom last January, the plants growing just in front of the Botanical laboratory where they were

exposed to the north wind, but a few days of sunshine would melt off the snow and bring them into bloom.

The same sort of observations were continued last November, and the plants which were in bloom at different times are given in the following table, (plants in bloom during the fall of 1888), from which it will be seen that the plants which remain in bloom longest in the fall are among our most troublesome weeds. Thus the dandelion came into bloom April 5th, and was last seen November 16th, so that its period of blooming was 225 days; the chickweed was in bloom 224 days and the shepherd's purse 221 days. Now all will agree, we think, that these come well toward the head of the list of injurious weeds, and that a large part of the trouble caused by them is due to their hardiness and the persistence with which they strive to produce seed. It is easy to see that this production of a second crop of seed will increase the probability that the plant will appear again the next season. Of course there are many bad weeds which remain in bloom only a short time, but these produce an abundance of easily distributed seed as in the case of most Compositæ.

PLANTS IN BLOOM ON THE UNIVERSITY FARM DURING THE FALL OF 1888.

Black Mustard (<i>Brassica Nigra</i> , L.).....	November 4th, 12th, 21st.
Shepherd's Purse (<i>Capsella Bursa-pastoris</i> , Mench.).....	November 5th, 12th.
Pepper Grass (<i>Lepidium Virginicum</i> , L.).....	November 5th, 12th, 21st, December 1st.
Radish (<i>Raphanus sativa</i> , L.).....	November 5th, 11th.
Blue Violet (<i>Viola cucullata</i> , Ait.).....	October 23d, November 5th.
Chickweed (<i>Stellaria media</i> , Smilh.).....	November 12th.
Low Mallow (<i>Malva rotundifolia</i> , L.).....	November 12th, December 1st.
White Clover (<i>Trifolium repens</i> , L.).....	November 11th.
Red Clover (<i>T. pratense</i> , L.).....	November 12th.
Sweet-scented Clover (<i>Melilotus alba</i> , L.).....	November 4th, 12th, 24th.
Wild Parsnip (<i>Pastinaca sativa</i> , L.).....	November 5th.
Aster (<i>A. cordifolius</i> , L.).....	November 7th.
Aster (<i>A. prenanthoides</i> , Muhl.).....	November 10th.
White Weed (<i>Erigeron annuus</i> , Pers.).....	November 13th, 21st, 23d.
Flea-bane (<i>E. strigosum</i> , L.).....	November 21st.
Flea-bane (<i>E. Canadense</i> , L.).....	November 7th.
American Sneezewort (<i>Helenium autumnale</i> , L.).....	November 5th.
May Weed (<i>Anthemis Cotula</i> , D. C.).....	November 11th.
Yarrow (<i>Achillea Millefolium</i> , L.).....	November 4th.
Dandelion (<i>Taraxicum officinale</i> , Weber.).....	November 11th, 16th.
Sow-thistle (<i>Sonchus asper</i> , Vill.).....	November 4th, 13th.
Catnip (<i>Nepeta Cataria</i> , L.).....	November 12th.
Motherwort (<i>Leonurus Cardiaca</i> , L.).....	November 4th, 8th.
Mild Water Pepper (<i>Polygonum hydropiperoides</i> , Mx.).....	November 4th.
Bird's Knot Grass (<i>P. aviculare</i> , L.).....	November 4th.
Timothy (<i>Phleum pratense</i> , L.).....	November 3d.

This table shows what a wonderful vitality our weedy plants have; they spring up early in the season and continue in bloom until the snow

comes in winter, many of them being in bloom for six months and a few for seven. The period of blooming may be readily determined by comparing the dates here given with those of the first appearance in bloom given after the name of each plant in the catalogue.

THE MAPS.

In order to indicate localities with more exactness and to facilitate reference to them I have employed the admirable system of co-ordinates suggested by Professor Comstock in "Science," vol. VII, p. 352, from which I have adapted the following description :

In our local survey a well known point on the University grounds is taken as a centre, and through this point on the map a north and south and an east and west line are drawn, which are marked 0. Other lines are drawn parallel to these, dividing the map into squares, each line indicating a distance of 400 feet. These lines are numbered, beginning in each case at the one next the zero line and reading toward the margin of the page. By means of roads, streams and other conspicuous objects, the position on the map of any locality can be easily ascertained, and its distance north or south of one zero line, and east or west of the other seen at a glance.

I took as a center of reference the stone on the campus S. W. of the college building, as its position is accurately known. It is lat. $40^{\circ} 0' 00''$ N., long. $83^{\circ} 0' 0''$ W.; alt. 757 feet above ~~Lake Erie~~. The necessary survey of the farm with the draughting of the map was done by my friend, Mr. J. H. Large of the class of '90, to whom my thanks are due for the excellent manner in which he has performed the task. Portions of the farm lying east of Neil avenue had been previously surveyed, but this is the first map of the entire farm that has been made. Certain localities often referred to are not named on the map, so we give their position below:

College spring, S. $1\frac{1}{2}$, E. $\frac{3}{4}$; Culvert, S. $2\frac{1}{2}$, E. 0; Iron spring, S. $2\frac{1}{2}$, E. $2\frac{1}{2}$; Grass-plot field, N. 0 to $1\frac{1}{2}$, E. $2\frac{1}{2}$ to $3\frac{1}{2}$; Island spring, N. $2\frac{1}{2}$, W. 3; Nursery, S. $2\frac{1}{2}$, E. $1\frac{1}{4}$.

CLASSIFICATION.

I have tried to follow the latest system of nomenclature, but in many cases this has been very difficult to do as there is at present no accessible work which embodies all the late advances in botanical classification. In the Gamopetalæ I have followed Dr. Gray's Synoptic Flora of North America, and in other cases have consulted the latest authorities within reach, striving always to employ the names sanctioned by the late Dr. Gray.*

*In the main the classification is the same as that in the sixth edition of Gray's Manual.

STATISTICS OF THE CATALOGUE.

I desired to make some comparisons regarding the size of our flora as compared with that of the county and State, but that of the county was made so long ago and so many changes have occurred in its flora, new species being introduced and old ones disappearing, that a detailed comparison would not be worth while. Besides, the genera and orders have been changed so that it would be hardly fair to compare this list with Dr. Sullivan's "Catalogue of Plants in the vicinity of Columbus" (published in 1840); however, I will make a few comparisons. Of the 1646 species and varieties found in the State, 716 are found in the county, and of these 464, or more than half of those growing in the county, are found within our limits. The following table exhibits the number of species and genera belonging to the principal natural orders mentioned in the catalogue and compares them with those found in the county and State:

COMPARISON OF THE MORE IMPORTANT ORDERS.

Orders.	Univ. Flora.	Franklin Co.	Ohio.
Compositæ	70	77	208
Cyperacæ	17	64	160
Graminacæ	23	52	132
Leguminosæ	21	37	69
Rosacæ	19	36	67
Labiatae	22	36	57
Ranunculacæ	22	30	45
Cruciferae	20	21	39
Orchidacæ	2	8	38
Ericacæ	0	0	38

COMPARISON OF GENERA.

Orders.	Univ. Flora.	Franklin Co.	Ohio.
Carex	12	41	107
Aster	8	19	35

COMPARISON OF OUR FLORA WITH THAT OF THE STATE.

	Orders.	Univ. Flora.		Ohio Flora.	
		Genera.	Species.	Genera.	Species.
1	Ranunculaceæ.....	11	22	15	45
2	Anonaceæ.....	1	1	1	1
3	Menispermaceæ.....	1	1	1	1
4	Berberidaceæ.....	2	2	4	4
5	Papaveraceæ.....	1	1	5	6
6	Fumariaceæ.....	2	3	4	7
7	Cruciferae.....	13	23	14	39
8	Violaceæ.....	1	7	2	16
9	Caryophyllaceæ.....	5	6	9	27
10	Portulacaceæ.....	2	3	2	3
11	Hypericaceæ.....	1	3	2	12
12	Malvaceæ.....	3	3	5	10
13	Tiliaceæ.....	1	1	1	2
14	Linaceæ.....	1	1	1	2
15	Geraniaceæ.....	4	5	5	10
16	Rutaceæ.....	3	3	2	2
17	Simarubaceæ.....	1	1	1	1
18	Celastraceæ.....	2	3	2	4
19	Vitaceæ.....	2	2	2	5
20	Sapindaceæ.....	4	7	4	11
21	Anacardiaceæ.....	1	2	1	6
22	Leguminosæ.....	12	21	23	69
23	Rosaceæ.....	9	19	14	67
24	Saxifragaceæ.....	1	1	9	18
25	Crassulaceæ.....	1	1	2	4
26	Hamamelaceæ.....	1	1	2	2
27	Haloragaceæ.....	1	2	2	4
28	Lythraceæ.....	1	1	4	7
29	Onagraceæ.....	5	7	5	16
30	Cucurbitaceæ.....	2	2	2	2
31	Umbelliferae.....	10	11	23	35
32	Cornaceæ.....	1	1	2	8
33	Caprifoliaceæ.....	1	1	6	23
34	Rubiaceæ.....	1	5	5	18
35	Valerianaceæ.....	1	1	2	6
36	Dipsaceæ.....	1	1	1	1
37	Compositæ.....	31	70	53	208
38	Lobeliaceæ.....	1	2	1	6
39	Campanulaceæ.....	2	2	1	4
40	Primulaceæ.....	2	2	5	13
41	Oleaceæ.....	1	3	4	8
42	Apocynaceæ.....	1	1	2	5
43	Asclepiadaceæ.....	1	2	5	15
44	Polemoniaceæ.....	2	4	2	8
45	Hydrophyllaceæ.....	2	5	2	8
46	Borraginaceæ.....	4	5	9	18
47	Convolvulaceæ.....	3	5	4	12
48	Solanaceæ.....	3	6	5	10
49	Scrophulariaceæ.....	10	17	17	37
50	Orobanchaceæ.....	1	1	3	3
51	Bignoniaceæ.....	1	1	4	4
52	Acanthaceæ.....	2	2	2	3
53	Verbenaceæ.....	3	4	3	7
54	Labiatae.....	15	22	27	57

COMPARISON OF OUR FLORA, ETC.—Continued.

	Orders.	Univ. Flora.		Ohio Flora.	
		Genera.	Species.	Genera.	Species.
55	Plantaginaceae	1	4	1	6
56	Illecebraceae	1	1	1	1
57	Amarantaceae	1	2	3	8
58	Chenopodiaceae	1	1	3	9
59	Phytolaccaceae	1	1	1	1
60	Polygonaceae	2	12	3	31
61	Piperaceae	1	1	1	1
62	Lauraceae	1	1	2	2
63	Euphorbiaceae	2	5	3	12
64	Urticaceae	10	12	10	16
65	Plantanaceae	1	1	1	1
66	Juglandaceae	2	6	2	9
67	Cupuliferae	5	8	6	33
68	Salicaceae	2	7	2	24
69	Ceratophyllaceae	1	1	2	4
70	Hydrocharidaceae	1	1	2	2
71	Orchidaceae	2	2	14	38
72	Iridaceae	1	1	2	4
73	Liliaceae	8	12	20	39
74	Pontedariaceae	1	1	3	4
75	Juncaceae	1	2	2	18
76	Typhaceae	2	2	2	5
77	Araceae	3	4	5	6
78	Lemnaceae	2	2	2	4
79	Alismaceae	2	9	4	10
80	Naiadaceae	1	3	3	15
81	Cyperaceae	4	17	13	160
82	Gramineae	18	23	50	132

Total number of genera.....	272.....	477
Total number of species and varieties.....	468.....	1646
Number of orders represented.....	82.....	112

SYSTEMATIC DISTRIBUTION OF ORDERS AND GENERA.

	Orders.	Genera.	Species and varieties.
Polypetalæ	32	105	167
Gamopetalæ	25	90	168
Total Dichlamydeæ	57	197	335
Monochlamydeæ	11	31	56
Total Dicotyledons.....	68	224	392
Monocotyledons	14	46	77
Gymnospermæ	00	000	000
Total Phænogamia	82	272	468

COMPARISON WITH OTHER FLORAS.

Total number of species and varieties in our flora.....	468
In Franklin county.....	716
In Ohio.....	1646
In Missouri.....	1735
In New Jersey.....	1672
In Cayuga Flora, N. Y.....	1278
In Buffalo Flora, N. Y.....	1277

ACKNOWLEDGMENTS.

I am especially indebted to Prof. W. R. Lazenby for much valuable advice and assistance in the preparation of this catalogue. I am also under many obligations to Mr. J. H. Large for his careful and painstaking work in the preparation of the accompanying map. Many of the students have rendered assistance by bringing in new species or by finding new localities for previously known plants. Prof. Dudley's excellent "Flora of the Cayuga Valley" has given me many hints as to the form and character of my catalogue, and I have consulted with profit several other floras.

OHIO STATE UNIVERSITY, *June*, 1889.

Catalogue of Uncultivated Flowering Plants.

DICOTYLEDONS.

I. RANUNCULACEÆ. Crowfoot Family.

1. CLEMATIS, Linn.

1. C. VIRGINIANA, L. Virgin's Bower.

Common along the brook and near the river, growing over bushes and climbing upon trees and fences. W. 2 to 3½. July 27, 1882; July 31, 1889.

2. ANEMONE, Tourn.

2. A. VIRGINIANA, L. Virginian Anemone.

Rare, occurs in the clover field near the river north of the road where one or two specimens have been found. It prefers a dry soil. July 24, 1887.

3. A. PENNSYLVANICA, L. (*A. Dichotoma*, L.) Pennsylvanian Anemone.

Mr. W. S. Devol found this growing along the river in June, 1882, but I was unable to find it this spring. June 1, 1882; May 31, 1884; May 23, 1887; June 9, 1888; June 1, 1889.

4. A. NEMOROSA, L. Wood Anemone.

Not common; grows sparingly in the belt of woods along the river south of the brook.

5. A. NEMOROSA, L. var. QUINQUEFOLIA, Gr. Wind-flower.

This variety has been found along the fence which runs from the seed barn west to the river. It appears to be gradually dying out as little could be found there this spring. April 24, 1882; April 16, 1884; April 24, 1885; April 15, 1886; April 8, 1887; April 10, 1888; April 26, 1889.

3. HEPATICA, Dill.

6. H. TRILOBA, Chaix (*Anemone hepatica*, L.) Liver-leaf.

Woods; rare; has not been found of late years. April 9, 1883; April 16, 1884; April 17, 1885; March 27, 1886; March 19, 1887; April 1, 1888; March 20, 1889.

4. ANEMONELLA, Spach.

7. A. THALICTROIDES, Spach. (*Thalictrum anemonoides*, Mx.) Rue Anemone.

Common along the river bank and along the fence from the seed barn to the river. April 7, 1882; April 16, 1883; April 17, 1884; April 24, 1885; April 29, 1888; March 29, 1889.

5. THALICTRUM, Tourn.

8. *T. dioicum*, L. Early Meadow Rue.

Grows on the dike and in the strip of woods lying along the river near the island. N. 3½, W. 4½. A small clump also occurs in the southwest corner of the farm on the river bank. S. 4½, W. 5. It is not so common as the next species. April 14, 1882; May 12, 1885; April 17, 1887; April 29, 1888; April 20, 1889.

9. *T. polygamum*, Muhl. (*T. Cornuti*, Gray's Manual 5th ed.) Tall Meadow Rue.

Both the staminate and pistillate forms grow in the damp rich soil of the woods around the island, N. 3½, E. 3½. June 6, 1882; June 2, 1883; May 26, 1884; May 29, 1889.

10. *T. purpurascens*, L. Purplish Meadow Rue.

This occurs on the south side of the dike and in the woods northwest of the island. N. 3½, E. 4.

6. RANUNCULUS, Tourn.

11. *R. aquatilis*, L. var. *trychophyllus*, Gr. White Water Crowfoot.

In the island swamp and pond where the water flows slowly, N. 2½, W. 3½. The whole plant is submerged except the small white flowers which are so thickly crowded together as to render the surface of the water white. Abundant in this locality but not found elsewhere in our limits.

12. *R. abortivus*, L. Small-flowered Crowfoot.

Common on the campus and in pastures, growing best in damp rich soil where it often attains a large size. It is generally distributed, is quite variable in form and has a weedy tendency. April 11, 1882; April 16, 1883; April 23, 1884; May 6, 1885; April 16, 1886; April 11, 1887; April 18, 1888; April 7, 1889.

13. *R. fascicularis*, Muhl. Early Crowfoot.

Grows in wet rich soil N. E. of the island, but is not as common as the next species. N. 3, W. 3½. April 14, 1882; April 25, 1883; April 20, 1884; April 29, 1888.

14. *R. recurvatus*, Poir. Hooked Crowfoot.

Abundant in the woods where it grows vigorously, but is not found elsewhere. June 25, 1888; May 12, 1889.

15. *R. repens*, L. Creeping Crowfoot.

This is very common in moist shady places, in the woods and along the river, especially around the island swamp. May 10, 1884; April 21, 1886; April 20, 1887; May 2, 1888.

16. *R. bulbosus*, L. Bulbous Crowfoot.

Prof. W. R. Lazenby has seen specimens of this growing within our limits, but it is quite rare, and I have been unable to find it.

17. *R. acris*, L. Buttercup. Tall Crowfoot.

This species likes rather dry places. It was found on the campus several years ago by Mr. W. S. Devoil, when it was rather common. It has not been noticed lately and probably does not now occur in our limits. June 12, 1882; May 2, 1883; May 26, 1884; May 10, 1885; April 27, 1887.

7. ISOPYRUM, Linn.

18. *I. biternatum*, T. & G. False Rue Anemone.

Common on the bottom lands along the river south of the brook, and around the island, N. 3, W. 3. April 18, 1882; April 25, 1883; April 17, 1884; April 25, 1885; April 15, 1886; April 10, 1887; April 15, 1888; April 13, 1889.

8. *CALTHA*, Linn.19. *C. PALUSTRIS*, L. Marsh Marigold.

This is probably extinct. I found three plants during the summer of 1886, growing in a small bog in the pasture field west of the large dormitory; some one dug these up and none have been found there since although careful search has been made. S. $3\frac{1}{2}$, W. $2\frac{1}{2}$ April 14, 1882; April 27, 1883; April 20, 1884; May 3, 1885; April 19, 1886; April 2 1887; April 18, 1888; March 26, 1889.

9. *DELPHINIUM*, Tourn.20. *D. TRICORNE*, Mx. Dwarf Larkspur.

This is also rare. I noted a single specimen in the woods in June, 1887, and this spring found several plants there, so it is spreading slowly. Southwest corner of woods near the stile, N. 2, E. $2\frac{1}{2}$. April 20, 1882; May 9, 1887; May 13, 1888; April 27, 1889.

10. *ACTÆA*, Linn.21. *A. SPICATA*, L. Baneberry.

A single specimen was found May 12 in the woods near the east stile; this is the only one found on the place since I have been here. N. $2\frac{3}{4}$, E. $3\frac{1}{2}$. It is said that several specimens were found along the river a few years ago. June 4, 1882.

11. *HYDRASTIS*, Linn.22. *H. CANADENSIS*, L. Turmeric Root.

Rare. One or two specimens were found in the woods this spring. I have looked carefully for it in other places without success. May 1, 1882; May 11, 1883; May 10, 1884; May 19, 1885; May 14, 1887; May 5, 1888; April 24, 1889.

II. *ANONACEÆ*. Papaw Family.12. *ASIMINA*, Adans.23. *A. TRILOBA*, Dunal. Papaw.

This tree is well distributed, preferring a deep rich soil. It is common along the river, in the woods, and on the island where it was formerly very abundant, but nearly all the trees were cut down when the island was cleared off, and the few specimens that remain are small shrubs that bear but little fruit. May 23, 1882; May 5, 1883; May 28, 1884; May 23, 1885; May 7, 1887; May 10, 1888; April 24, 1889.

III. *MENISPERMACEÆ*. Moonseed Family.13. *MENISPERMUM*, Linn.24. *M. CANADENSE*, L. Moonseed Vine.

This is common along the river, south of the road, climbing upon trees and shrubs. It also grows along the brook near the barn and about the island on the river bank, but more sparingly than in the above locality. June 4, 1882; June 5, 1883; June 6, 1884; May 26, 1885; May 29, 1887; June 18, 1888.

IV. BERBERIDACEÆ. Barberry Family.

14. CAULOPHYLLUM, Michx.

25. C. THALICTROIDES, Mx. Pappoose Root. Blue Cohosh.

I found, last summer, several specimens of this rare plant along the river west of the Catalpa Grove, N. 1, W. 5½. This spring I found a fine large specimen in the woods not far from Woodruff Avenue, N. 3½, E. 3. May 1, 1882.

15. PODOPHYLLUM, Linn.

26. P. PELTATUM, L. May-Apple. Mandrake.

Not very common. In the western part of the woods, N. 2½, E. 2½. Also along the river in the S. W. corner of the farm in rich moist soil, S. 4½, W. 6, and on the river bank east of the island, N. 1½, W. 2½. The plants bloom freely but produce scarcely any fruit. May 14, 1882; May 11, 1883; May 10, 1884; May 22, 1885; May 15, 1887; May 10, 1888.

V. PAPAVERACEÆ. Poppy Family.

16. SANGUINARIA, Dill.

27. S. CANADENSIS, L. Blood-Root.

Abundant on the hillside south of the botanical building but not found elsewhere, E. 1½, S. 2½. April 14, 1882; April 10, 1883; April 17, 1884; April 23, 1885; April 13, 1886; April 8, 1887; April 7, 1888; March 28, 1888.

VI. FUMARIACEÆ. Fumitory Family.

17. DICENTRA, Borkh.

28. D. CUCULLARIA, D. C. Dutchman's Breeches.

Common in moist shady places along the river and in the woods. April 7, 1882; April 14, 1883; April 16, 1884; April 25, 1885; April 15, 1886; April 13, 1887; April 10, 1888; April 11, 1889.

29. D. CANADENSIS, D. C. Squirrel Corn.

Occurs in the same localities as the above but is not so common. April 10, 1882; April 19, 1883; April 19, 1884; April 29, 1885; April 13, 1887; April 13, 1889.

18. CORYDALIS, Vent.

30. C. AUREA, Wild. Golden Corydalis.

Abundant on the island in the cornfield south of the dike, N. 3, W. 4½. It seems to grow best in cultivated fields. April 7, 1882; May 5, 1883; April 23, 1884; April 29, 1885; April 11, 1887; April 7, 1888.

VII. CRUCIFERÆ. Mustard Family.

19. DENTARIA, Linn.

31. D. LACINIATA, Muhl. Pepper-root.

Rather common along the river bank south of the brook; occasionally a specimen is found in the woods. It prefers a damp soil. April 27, 1882; April 16, 1883; April 17, 1884; May 5, 1885; April 16, 1886; April 12, 1887; April 11, 1888; March 22, 1889.

20. CARDAMINE, Tourn.

32. C. RHOMBOIDEA, D. C. White Spring-cress.

This grows sparingly in a small peat bog west of the large dormitory, S. $3\frac{1}{2}$, W. $2\frac{1}{2}$, and has not been found elsewhere. It is more common than the variety *purpurea*, and usually blooms a little later. April 27, 1882; May 11, 1883; April 20, 1884; April 29, 1885; April 17, 1887; April 16, 1888; April 14, 1889.

33. C. RHOMBOIDEA, D. C., var. PURPUREA, Torr. Purple Spring-cress.

This variety was first found along the river by Mr. W. J. Green in the spring of 1882. I found a few specimens this spring growing with the above species. April 13, 1882; April 20, 1884; April 17, 1887.

34. C. HIRSUTA, L. Bitter Cress.

Occurs rather sparingly in the woods not far from the west fence N. $2\frac{1}{2}$, E. $2\frac{1}{2}$. Although usually found in wet places I have sometimes met it in dry pastures. April 27, 1882; May 24, 1885; April 8, 1889.

21. ARABIS, Linn.

35. A. HIRSUTA, Scop.

There is a specimen in the University herbarium collected by Mr. Devol in the spring of 1882, which bears this name. I have been unable to find it and am inclined to think that he mistook the *dentata* for the above, as the stellate hairs are abundant on it and the leaves are toothed. May 6, 1884.

36. A. LÆVIGATA, Poir. Rock Cress.

Prof. Lazenby has seen this growing near the river. I have never seen it and think it must be quite rare. April 30, 1882; May 5, 1884; May 24, 1885.

22. TURRITIS, Dill.

37. T. GLABRA, L. (*Arabis perfoliata*, Lam. of Gray's Manual.) Tower Mustard.

Abundant on the river bank near the island at the head of the lagoon, N. $1\frac{3}{4}$, W. $1\frac{1}{2}$, but sparingly in other localities. A specimen is occasionally found on the campus or in the woods. May 3, 1887; April 29, 1888; April 11, 1889.

38. T. STRICTA, Graham. (*Arabis confinis*, Watson of Gray's Manual).

Rare. A few plants have been found on the river bank near the island.

39. A. DENTATA, T. & G.

This is quite abundant along the river bank, from the dike on the north boundary of the farm to the line fence on the south. April 19, 1889.

23. CAMELINA, Crantz.

40. C. SATIVA, Crantz. False Flax.

I found four specimens May 22, in the wheat-field near the river and a little north of the fence which runs west from the seed barn to the river. Several specimens were found in the same field in 1883. N. $1\frac{1}{2}$, W. $2\frac{1}{2}$.

24. NASTURTIIUM, R. Br.

41. N. OFFICINALE, R. Br. Water-cress.

Rather rare. Specimens may be found in the swamp northeast of the island, the only locality on the farm N. 3, W. 3½. The plants grow in the muddy soil along the bank or in the water, above which the stem and flowers rise while most of the leaves are immersed. May 10, 1882; June 2, 1884; May 6, 1887; May 12, 1888; April 19, 1889.

42. N. PALUSTRE, D. C. Marsh-cress.

Common in damp waste places along the river. Several fine specimens were found last summer near the west stile of the brook pasture, S. 1½, E. 2½. May 21, 1884; June 10, 1887.

25. BARBAREA, R. Br.

43. B. VULGARIS, R. Br. Winter Cress.

Occurs on the river bank near the island spring and in pasture fields. Not common. There were several plants found west of the woods near Woodruff avenue this spring. May 14, 1883; May 6, 1884; May 30, 1887; May 8, 1889.

26. SISYMBRIUM, Tourn.

44. S. OFFICINALE, Scop. Hedge Mustard.

Not common. Pasture east of woods and in waste places. June 3, 1884; June 10, 1887

27. THELYPODIUM, Endl.

45. T. PINNATIFIDUM, Watson. (*Arabis hesperidoides*, Gray. *Iodanthus pinnatifida*, T. & G.) False Rocket.

Along the north bank of the brook from the barn west nearly to the river and around the island. Also in the woods, but is not very common. May 31, 1884; May 24, 1887; June 7, 1888; April 30, 1889.

28. BRASSICA, Tourn.

46. B. SINAPISTRUM, Boiss. Yellow Mustard. (*Sinapis arvensis*, L.)

Occurs in cultivated fields west of the barn, but is not nearly so common as the Black Mustard. June 6, 1882; May 28, 1883; May 24, 1887.

47. B. ALBA, Gray. White Mustard.

Very rare. A few specimens grow near a small frog pond just south of the dike, N. 3½, W. 3½. May 20, 1883.

48. B. NIGRA, Koch. Black Mustard.

Very common along fences and roadsides, also in fields and waste places near the barn. June 2, 1883; May 25, 1884; May 28, 1885; May 7, 1887; May 28, 1888.

29. CAPSELLA, Vent.

49. C. BURSA-PASTORIS, Moench. Shepherd's Purse.

This vile weed is far too common, growing everywhere in all sorts of soils and crowding out other plants. April 15, 1882; April 28, 1883; April 19, 1884; April 28, 1885; April 13, 1886; April 20, 1887; April 5, 1888; March 20, 1889.

30. LEPIDIUM, Linn.

50. L. VIRGINICUM, L. Pepper-grass.

This is also a bad weed quite common in pasture fields, meadows and along roadsides. May 24, 1882; June 2, 1884; May 21, 1885; June 1, 1887; May 20, 1888.

51. L. RUDERALE, L.

Found growing with the above but is very rare; it grows taller and is less branched

52. L. CAMPESTRE, Br. Yellow-seed.

This weedy plant which is not given in Beardslee's "Catalogue of the plants of Ohio," is very abundant in the northeast corner of the woods-meadow where it is spreading rapidly. N. 3½, E. 4½. It is one of our recently introduced plants. Six years ago there was scarcely any to be found there; it now covers the northern half of the field, and is becoming common in other places. May 24, 1882; May 28, 1883; May 26, 1884; May 6, 1887; May 12, 1888; April 29, 1889.

31. RAPHANUS, Tourn.

53. R. SATIVUS, L. Radish.

This was found last summer growing along Woodruff Avenue northwest of the Holmes house, in rich moist soil. It had probably escaped from cultivation, but as it has been noticed in this locality for several years it was thought best to insert it with this explanation. N. 3½, W. 1. June 9, '87.

VIII. VIOLACEÆ. Violets.

32. VIOLA, Tourn.

56. V. ROTUNDIFOLIA, Mx. Sweet Yellow Violet.

Mr. Green reported this in 1882 as found in the University woods. It is possible that he mistook the pubescens for it, as some specimens resemble the *rotundifolia* or it may have become extinct. April 12, 1882; April 21, 1883; April 23, 1884; May 6, 1885; March, 1886; April 14, 1889. I have never found it in the vicinity of Columbus.

57. V. PUBESCENS, Ait. Downy Yellow Violet.

Abundant in the woods 200 feet from southwest corner, and north of race track. Those found here are small and smooth, being only a few inches high and acaulescent in some specimens, while those found in other parts of the woods and along the river near the south boundary where it is common, are large and hairy, growing often eight inches high with a large thick stem. This difference in size seems to be due mainly to a different soil and location. May 1, 1882; May 10, 1885; April 17, 1887; April 26, 1888; April 19, 1889.

54. V. PALMATA, L., var. CUCULLATA, Gr. (*V. cucullata*, Ait.) Blue Violet.

Abundant along the south fence, and common along the river on the island and in the woods. The color and size vary in different localities. Several pure white specimens were found April 25 in the woods near Woodruff Avenue. April 12, 1882; April 21, 1883; April 17, 1884; April 24, 1885; April 18, 1886; April 14, 1887; April 18, 1888; April 13, 1889.

55. *V. BLANDA*, L. White Violet.

Very rare; a few specimens have been found along the river. One was found April 19, a little north of the island spring, N. 2 $\frac{1}{4}$, W. 3. April 26, 1883; April 28, 1887.

58. *V. CANADENSIS*, L. Canadian Violet.

This species was quite abundant on the island before it was cleared off, but is now rapidly dying out and will soon be a thing of the past. I was unable to find a single specimen this spring though the ground was carefully searched.

59. *V. STRIATA*, Ait. Pale Violet.

This grows quite abundantly in the western part of the woods near the path and along the fence west from the stile for about one-third the distance to the seed barn, N. 1 $\frac{3}{4}$, E. 1 $\frac{3}{4}$. It also grows sparingly in the southwest corner of the farm in a small thicket of Buckeyes where the soil is rich and moist. April 17, 1882; May 5, 1883; April 23, 1884; May 12, 1885; April 22, 1887; May 1, 1888; April 19, 1889.

60. *V. TRICOLOR*, L., var. *ARVENSI*S, D. C. Field Pansy.

Found only in a small cluster a little northeast of the walk leading to the botanical building, N. 1 $\frac{1}{2}$, E. 1 $\frac{1}{2}$. Just how it came there is not known, but it has probably escaped from cultivation, although it grows wild up Neil's Run near the C., C., C. & St. L. track and also west of the city near the Insane Asylum. May 1, 1884; May 2, 1888; April 15, 1889.

IX. CARYOPHYLLACEÆ.

33. *SAPONARIA*, Linn.61. *S. OFFICINALIS*, L. Bouncing Bet.

Grows on the hillside north of the lake, behind the chemical building and along the river near the island. Not very common, but is spreading rapidly. July 8, 1882; June 29, 1887; July 9, 1888.

34. *SILENE*, Linn.62. *S. VIRGINICA*, L. Mountain Pink. Fire Pink.

This beautiful plant, which deserves a place in our gardens, grows in the woods east of the island, but is rare within our limits. June 8, 1882; May 18, 1884; May 30, 1887; June 7, 1888.

35. *LYCHNIS*, Tourn.63. *L. GITHAGO*, Lam. Corn Cockle.

This handsome weed grows near Dr. Townshend's garden and in grain fields near the river, but is not common. June 6, 1882; June 9, 1884; May 30, 1887; June 5, 1888.

36. *STELLARIA*, Linn.64. *S. MEDIA*, Smith. Chickweed.

Very common everywhere. In the woods, along fences and in cultivated fields. A small patch in front of the botanical building was in bloom nearly all winter although exposed to the cold northwest winds. April 21, 1884; May 7, 1885; April 15, 1886; April 8, 1887; April 2, 1888; March 16, 1889.

37. CERASTIUM, Linn.

65. *C. VISCOSUM*, L. Mouse-ear Chickweed.

Common along the river bank east of the island along the dike, and in the woods, growing best in moist shady places where it attains a large size. Some specimens have been found which were two feet high. April 18, 1882; May 26, 1884; May 1, 1888; April 20, 1889.

66. *C. ARVENSEI*, L. Field Mouse-ear Chickweed.

In fields near the river and in the woods, but is not so common as the above. April 30, 1882; May 14, 1883; May 13, 1884; May 12, 1885.

X. PORTULACACEÆ. Purslanes.

38. PORTULACA, Tourn.

67. *P. OLERACEA*, L. Purslane.

This bad weed is common in the rich soil of gardens and in waste ground. July 20, 1882; June 22, 1887.

39. CLAYTONIA, Gronov.

68. *C. VIRGINICA*, L. Spring Beauty.

Very abundant in the woods but only a few are found elsewhere. April 6, 1882; April 10, 1883; April 16, 1884; April 23, 1885; April 13, 1886; March 19, 1887; April 1, 1888; March 17, 1889.

69. *C. CAROLINIANA*, Mx. Spring Beauty.

This species is very rare; I found a few specimens this spring in the southeastern part of the woods growing in the rich soil around an old stump. May 22, 1885.

XI. HYPERICACEÆ. St. John's-worts.

40. HYPERICUM, Tourn.

70. *H. PERFORATUM*, L. Common St. John's-Wort.

Rare; a few specimens may be found on the river bank west of the island, growing along the dike, N. $3\frac{1}{2}$, W. $4\frac{3}{4}$. June 19, 1887.

71. *H. MACULATUM*, Walt. (*H. corymbosum*, Muhl.) St. John's-Wort.

I found three plants this spring growing on a small island in the large pond which divides the island into two sub-equal parts. They grew in a damp place among a cluster of willow bushes, N. $1\frac{1}{2}$, W. $4\frac{3}{4}$. July 11, 1882; July 24, 1887.

72. *H. MUTILUM*, L. Dwarf St. John's-Wort.

I found a few specimens along the brook a little to the east of the culvert last September. The masons in repairing the culvert this spring dug the bank back several feet and laid a wall, thus destroying the locality.

XII. MALVACEÆ. Mallows.

41. MALVA, Linn.

73. M. ROTUNDIFOLIA, L. Low Mallow.

Common along roadsides and in the edges of fields, also in gardens and partially cultivated orchards. It is especially abundant on a waste piece of ground, southeast of the botanical building. May 4, 1882; May 28, 1883; May 25, 1884; May 20, 1887; May 18, 1888.

42. SIDA, Linn.

74. S. SPINOSA, L. Spiny Sida.

Found in the meadow east of the woods, where it is now becoming abundant. It has been recently introduced and is spreading rapidly from seed. Six years ago there was none on the farm. July 24, 1887.

43. ABUTILON, Tourn.

75. A. AVICENNÆ, Cærtn. Velvet-leaf.

Sparingly on rich soils and in cultivated grounds. In the clover meadow west of barn and north of road. The eastern half of this field has been plowed up and divided into plots by the Experiment Station, but there will probably be plenty of these weeds remaining in other localities.

XIII. TILIACEÆ. Lindenblooms.

44. TILIA, Tourn.

76. T. AMERICANA, L. Basswood.

On the campus, along the river, and in the woods where there are several specimens. The linden does not seem to do well in this locality; many of the trees planted on the campus a few years ago have been broken down by the wind and several have died and been replaced. Where sheltered it grows quite large and makes a fine shade tree. July 15, 1882; June 24, 1887.

XIV. LINACEÆ. Flaxworts.

45. LINUM, Tourn.

77. L. USITATISSIMUM, L. Common Flax.

This was cultivated in a field near the island last summer and some of it came up this year. Escaped from cultivation, but is probably not permanently established. Specimens were found this spring growing in moist soil along the river bank and in the fields lying adjacent to the one where it was grown last year.

XV. GERANIACEÆ. Geranium Family.

46. GERANIUM, Tourn.

78. G. MACULATUM, L. Crane's-bill.

Sparingly on the bank of the lagoon a little to the north of the island spring, N. 2½, W. 3. Several specimens were found in the woods seven years ago, but there are none there now. May 2, 1882; May 8, 1883; May 6, 1884; May 10, 1885; May 4, 1887; May 8, 1888; April 27, 1889.

47. FLERKEA, Willd.

79. F. PROSERPINACOIDES, Willd. False Mermaid.

This is very abundant in the woods and is found sparingly near the island. Grows luxuriantly in damp shady places. May 17, 1882; April 28, 1889.

48. OXALIS, Linn.

80. O. CORNICULATA, L. var. STRICTA, Sav. (*O. stricta*, L.) Yellow Wood-sorrel.

Common in the woods and in various places on the farm. In dry soils it grows only a few inches high, but in rich moist soils along the river it attains a height of eight or nine inches, the flowers become larger and have a pink center. May 14, 1882; April 26, 1884; May 26, 1885; May 25, 1887; June 5, 1888.

49. IMPATIENS, Linn.

81. I. PALLIDA, Nutt. Pale Touch-me-not.

Both this and the next species are common in damp situations near the river. Very abundant just south of the Catalpa grove. July 11, 1882; August 6, 1884.

82. I. FULVA, Nutt. Jewel-weed.

Found with *I. pallida*, but is not so common. Grows south of the lake. June 19, 1887.

XVI. RUTACEÆ. Rueworts.

50. XANTHOXYLUM, Linn.

83. X. AMERICANUM, Mill. Prickly Ash.

This is quite rare, and only a few specimens have been found within our limits. There are five small shrubs along the river bank west of the seed barn, N. 2, W. 1½. Last summer the only one in the woods was cut down, but it may start up again. April 26, 1882; May 8, 1884; May 10, 1885; April 24, 1889.

51. PTELEA, Linn.

84. P. TRIFOLIATA, L. Shrub Trefoil.

A single tree ten or twelve feet high is growing along the river bank west of the seed barn, N. 1½, W. 2½. June 12, 1887. This is a very rare plant about Columbus; one specimen grows two miles north of the city near the river, and there is one growing in Goodale Park. These are the only ones I know of in the county.

XVII. SIMARUBACEÆ. Quassia Family.

52. AILANTHUS, Desf.

85. A. GLANULOSUS, Desf. Chinese "Tree of Heaven."

There are two large trees on the hill north of the lake, S. 1, E. $\frac{3}{4}$. They are thoroughly naturalized and would spread rapidly if permitted to do so, as each spring they throw out a large number of shoots from the base of the tree

XVIII. CELASTRACEÆ. Staff Trees.

53. CELASTRUS, Linn.

86. C. SCANDENS, L. Bitter-sweet.

I have not found it within our limits, but there is a specimen in the University herbarium labeled "Olentangy river," which is said to have been found here. June 8, 1884; June 12, 1888; June 7, 1889.

54. EUONYMUS, Tourn.

87. E. ATROPURPUREUS, Jacq. Burning Bush.

Quite common along the river bank east of the island, N. $1\frac{1}{2}$ to 3, W. 3. June 18, 1888; June 8, 1889.

XIX. VITACEÆ. Vines.

55. VITIS, Tourn.

88. V. CORDIFOLIA, Mx. Frost Grape.

In the woods and along the river south of the brook climbing on trees and shrubs. May 26, 1885; May 18, 1887; May 29, 1888.

89. V. ROTUNDIFOLIA, Mx. (*V. Vulpina* L.) Fox Grape.

This is found on the island, N. 2, E. $4\frac{1}{4}$, and along the river bank. June 2, 1884.

56. AMPELOPSIS, Mx.

90. A. QUINQUEFOLIA, Mx. Virginia Creeper.

Common along the brook and around the island. There are two distinct forms growing on the campus. One variety has short branching tendrils and each subdivision ends in a sucker-like disk by which it can climb walls: it is the form growing on the north side of the botanical building. The other variety has long unbranched tendrils without disks, and climbs trees, trellises, etc; it grows at the east end of the college building. These forms were first described by Prof. W. R. Lazenby in the Experiment Station Report for 1886. July 15, 1882.

XX. SAPINDACEÆ. Soapworts.

57. ÆSCULUS, Linn.

91. A. GLABRA, Willd. Ohio Buckeye.

This, our characteristic tree, is quite common in the moist rich soils along the river being especially abundant near the southwest corner of the farm where there are a great

many small trees. The larger trees are found farther north and in the woods. Some good sized trees grow on the campus. May 8, 1882; May 4, 1884; May 7, 1885; May 1, 1887; May 5, 1888; April 19, 1889.

58. ACER, Tourn.

92. A. SACCHARINUM, Wang. Sugar Maple.

Common on the campus and in the woods. March 15, 1882; April 24, 1884; April 29, 1885; April 20, 1887; April 21, 1888; April 20, 1889.

93. A. SACCHARINUM, L. var. NIGRUM, Tourn.—Gray. Black Maple.

There are one or two specimens on the campus and in the woods that agree fairly well with the description of this variety. April 24, 1884.

94. A. DASYCARPUM, Ehrh. Silver Maple.

This, our earliest blooming tree, is quite abundant along Neil Avenue. February 17, 1882; April 14, 1885; March 20, 1886; March 5, 1887; March 14, 1888; March 15, 1889.

95. A. RUBRUM, L. Red Maple.

Rare. There are a few trees in the woods and around the island. It blooms soon after the Silver Maple. March 4, 1882; March 17, 1883; April 17, 1884; March 20, 1886; March 20, 1888; March 16, 1889.

59. NEGUNDO, Moench.

96. N. ACEROIDES, Moench. Box-Elder.

There are several specimens on the campus and along the river. The largest one I have seen is in the meadow near the river and south of the road. April 20, 1884; April 27, 1885; April 25, 1887; April 16, 1889.

60. STAPHYLEA, Linn.

97. S. TRIFOLIA, L. Bladder-nut.

Along the river a little north of the turn in the road there are several bushes which produced fruit plentifully last year. S. 3, W. 6. May 11, 1882; May 8, 1883; May 19, 1884; May 21, 1885; May 3, 1887; May 10, 1888; May 10, 1889.

XXI. ANACARDIACEÆ. Sumachs.

61. RHUS, Linn.

98. R. GLABRA, L. Smooth-sumach.

Mr. Devol found a staminate plant on the farm near the river July 6, 1883, but it was cut down when the island was cleared off and has not been seen since.

99. R. TOXICODENDRON, L. Poison Ivy.

Very common in the woods and along the river climbing on trees and bushes. It often grows quite large; I found, last summer, by the lake, a specimen that had branches over four feet long. The vines frequently grow to the tops of our tallest trees. Some were found on the island a few years ago that were three inches in diameter. May 27, 1887.

XXII. LEGUMINOSÆ. Leguminous Plants.

62. TRIFOLIUM, Tourn.

100. *T. ARVENSE*, L. Rabbit-foot or Stone Clover.

This was growing in the grass-plot field north of Prof. Thomas' house, about N. $\frac{1}{4}$, E. $3\frac{1}{4}$, July 10, 1885.

101. *T. PRATENSE*, L. Red Clover.

Very abundant in meadows and pastures. May 14, 1882; May 22, 1883; May 21, 1884; May 26, 1885; May 12, 1887; May 23, 1888. Four and five-leaved specimens are frequently found; sixes more rarely, and on one occasion only have I found a seven-leaved clover (June, 1886). Sometimes in a three-leaved specimen there is a small cup-like leaf in the center. Last summer I found a one-leaved clover; the leaflet is slightly lobed on one side and is a little larger than usual.

102. *T. STOLONIFERUM*, Muhl.

Sparingly on the hillside over the lake, in the woods and on the west side of the island. N. $2\frac{1}{4}$, W. $5\frac{1}{4}$. May 30, 1882; June 10, 1884; May 27, 1887; May 29, 1888.

103. *T. REPENS*, L. White Clover.

Common in clover fields and on the lawn but not so abundant as *T. pratense*. May 18, 1882; May 22, 1883; May 6, 1884; May 26, 1885; May 15, 1887; May 23, 1888. A variety was found on the campus a few years ago in which each flower had a pedicel half an inch long. This spring I found several specimens growing south of the race track, which were more curiously modified; that is, the flowers were changed to leaves, for in each head came several leaves and the unchanged flowers were green instead of white, presenting a peculiar appearance. Four-leaved specimens are much more rare than in the red clover.

104. *T. HYBRIDUM*, L. Alsike Clover.

In the grass-plot field where it was formerly cultivated it has escaped from cultivation but is rather rare. July 26, 1882; June 11, 1887; June 25, 1888.

105. *T. PROCUMBENS*, L. Low Hop Clover.

This species, not given in Beardslee's "Catalogue of the plants of Ohio," was recently introduced and is now growing on the campus a little southwest of the college building. There are only a few plants at present. June 7, 1884; May 30, 1887.

63. MELILOTUS, Tourn.

106. *M. OFFICINALIS*, Willd. Yellow Melilot.

Near the causeway and north along the lagoon, S. $1\frac{1}{4}$, W. 5. June 11, 1887; June 25, 1888; June 4, 1889.

107. *M. ALBA*, Lam. Sweet Clover.

Same situations as the above; also near the culvert, but neither species is common. July 11, 1882; June 21, 1887; June 21, 1888; June 22, 1889.

64. MEDICAGO, Tourn.

108. *M. SATIVA*, L. Lucerne. Alfalfa.

A few specimens were found last summer along the road from Neil avenue to Mr. Green's house, S. $1\frac{7}{8}$, W. $\frac{3}{8}$. They had escaped from cultivation and are becoming established, as I found them again this spring. June 25, 1888.

109. *M. LUPULINA*, L. Black Medick.

On the campus southwest of the college building, back of the chemical laboratory and elsewhere, but it is not common though it is spreading rapidly. June 1, 1882; May 25, 1887; June 12, 1888; June 8, 1889.

65. *PYSORALEA*, Linn.110. *P. ONOBRYCHIS*, Nutt.

Abundant in the woods south of the dike, N. $3\frac{1}{4}$, W. $3\frac{1}{2}$.

66. *ROBINIA*, Linn.111. *R. PSEUDACACIA*, L. Locust. False Acacia.

There are several large trees on the campus, and there is a grove of small trees on the west side of the island. June 4, 1883; May 23, 1884; May 26, 1885; May 17, 1887; May 27, 1888.

67. *DESMODIUM*, Desv. Tick-Trefoil.112. *D. VIRIDIFLORUM*, Beck.

This grows on the island.

113. *D. CANADENSE*, D. C.

This species is very common on the island. August 11, 1882; July 30, 1887; July 31, 1889.

114. *D. RIGIDUM*, D. C.

Not so common as the others, but is found on the island just south of the road.

68. *LESPEDEZA*, Mx.115. *L. PROCUMBENS*, Mx. Bush Clover.

Along the river in the northwest corner of the farm and north of the dike, N. $3\frac{7}{8}$, W. $4\frac{5}{8}$.

69. *VICIA*, Tourn.116. *V. SATIVA*, L. Common Vetch.

Abundant in the grass-plot field back of the President's house where it was formerly cultivated and has now escaped. April 15, 1889.

70. *AMPHICARPEA*, Ell.117. *A. MONOICA*, Nutt. Hog Pea-nut.

In the southwest part of the island; rather common, climbing upon the surrounding plants. S. $1\frac{1}{4}$, W. $5\frac{3}{4}$.

71. *CERCIS*, Linn.118. *C. CANADENSIS*, L. Red-bud.

Very rare. Occurs on the campus east of the college building and along the river. April 30, 1882; May 1, 1883; May 12, 1884; May 12, 1885; April 20, 1886; April 24, 1887; May 5, 1888; April 20, 1889.

72. CASSIA, Tourn.

119. *C. MARILANDICA*, L. American Senna.

Ernest Evans found this last August in the clover meadow near the river, but I have been unable to find it this spring. August 2, 1882.

73. GLEDITSCHIA, Linn.

120. *G. TRIACANTHOS*, L. Honey-Locust.

In the woods and along the river. There is a large one on Neil avenue north of the large dormitory, S. 3, E $\frac{1}{4}$. June 10, 1882; June 7, 1884; May 30, 1887; June 10, 1888.

XXIII. ROSACEÆ. Roseworts.

74. PRUNUS, Tourn.

121. *P. PERSICA*, L. Peach.

There are three or four trees on the grounds; two of them are on the hillside southwest of the botanical building. April 7, 1882; May 5, 1883; April 19, 1886; April 15, 1887; April 23, 1888; April 13, 1889.

122. *P. CERASUS*, L. (*Cerasus vulgaris*, Mill). Sour Cherry.

There are several trees growing along 15th avenue a short distance from High street. This, like the above, sometimes springs up from seed and shows a slight tendency to spread. April 18, 1882; May 1, 1884; April 30, 1885; April 27, 1887; April 27, 1888; April 16, 1889.

123. *P. VIRGINIANA*, L. Choke Cherry.

A few specimens grow along the river. May 11, 1882; May 18, 1883; May 5, 1884; May 4, 1887; May 10, 1888; April 27, 1889.

124. *P. SEROTINA*, Ehrh. Wild Black Cherry.

There are several fine specimens along the fence from the woods to the seed barn; also on the campus and along the river. The largest tree is ten feet eight inches in circumference four feet above the ground. May 11, 1882; May 20, 1883; May 18, 1884; May 22, 1885; May 4, 1887; May 10, 1888; April 27, 1889.

75. RUBUS, Tourn.

125. *R. OCCIDENTALIS*, L. Black Raspberry.

This species, like the two following ones, is found around the island and near the river. June 1, 1882; May 28, 1883; May 21, 1884; May 26, 1885; May 30, 1887; May 27, 1888.

126. *R. VILLOSUS*, Ait. High Blackberry.

Common on the island around the swamp, N. 3, W. $\frac{1}{4}$. May 16, 1883; June 1, 1884; May 26, 1885; May 15, 1887; May 28, 1888.

127. *R. CUNEIFOLIUS*, Ph. Sand Blackberry.

Found in the same localities as the above but more sparingly. May 27, 1887.

76. GEUM, Linn.

128. G. ALBUM, Gmel.

Rather common in the woods. July 9, 1882; June 13, 1887.

129. G. VIRGINIANUM, L.

With the above, but less frequent.

130. G. VERNUM, T. & G.

Abundant in the woods, sparingly elsewhere. May 15, 1883; May 8, 1884; May 12, 1888. Not given in Sullivan's "Catalogue of plants growing in the vicinity of Columbus."

77. POTENTILLA, Linn.

131. P. NORVEGICA, L.

Occurs sparingly on the campus and in dry pastures. June 12, 1887.

132. P. RECTA, L.

Quite abundant a little to the southeast of Horticultural Hall, which is the only locality known in the vicinity of Columbus. It is not given in Beardslee's "Catalogue of the plants of Ohio," having been recently introduced; it is now spreading rapidly. S. $1\frac{1}{2}$, E. $2\frac{1}{2}$. June 8, 1887; June 2, 1888; June 5, 1889.

133. P. CANADENSIS, L. Five-Finger.

This is common on the campus east of the botanical building and in the southwest part of the woods.

78. AGRIMONIA, Tourn.

134. A. EUPATORIA, L. Agrimony.

Occurs sparingly in the woods. July 27, 1882; July 24, 1887.

79. ROSA, Tourn.

135. ROSA RUBIGINOSA, L. Sweet Brier.

There is a single bush along the river bank east of the island and south of the spring, N. 2, W. $2\frac{1}{8}$. May 23, 1887; June 7, 1888.

80. PYRUS, Linn.

136. P. MALUS, L. Apple Tree.

Seems to be naturalized in the woods. April 18, 1882; May 1, 1883; May 5, 1884; May 10, 1885; April 24, 1887; May 2, 1888.

81. CRATÆGUS, Linn.

137. C. TOMENTOSA, L. Black Thorn.

Of the three trees on the grounds belonging to this genus two are probably this species; one is found in the eastern part of the woods, N. 2, E. $3\frac{1}{2}$, and another along the river south of the brook; S. $3\frac{1}{2}$, W. $5\frac{1}{8}$. The other is perhaps the following variety.

138. *C. PUNCTATA*, Jacq. (*C. tomentosa*, L. var. *punctata*, Gray.) Hawthorn.

This tree is situated in the northern part of the woods near Woodruff avenue, N. 3, E.

- 3½. May 25, 1883; June 1, 1884; May 16, 1885; May 12, 1888.

82. *AMELANCHIER*, Medic.

139. *A. CANADENSIS*, T. & G. Shad-bush.

There is but one specimen on the grounds, a small tree standing on the campus north of the botanical building, S. ½, E. 1½. April 14, 1882; April 28, 1883; April 30, 1884; April 24, 1885; April 19, 1886; April 25, 1887; April 27, 1888.

XXIV. SAXIFRAGACEÆ. Saxifrages.

83. *RIBES*, Linn.

140. *R. CYNOSBATI*, L. Prickly Gooseberry.

There are two or three bushes on the bank of the brook south of the botanical building. May 18, 1882; May 10, 1883; April 27, 1884; May 15, 1887; May 5, 1888; April 20, 1889.

XXV. CRASSULACEÆ.

84. *PENTHORUM*, Gronov.

141. *P. SEDOIDES*, L. Ditch Stone-crop.

Sparsely along the lagoons about the island. S. 1, W. 4½. August 2, 1882; July 31, 1889.

XXVI. HAMAMELIDÆ.

85. *LIQUIDAMBAR*, Linn.

142. *L. STYRACIFLUA*, L.

There are only a few specimens on the farm; one is west of the college building, the others are on the river bank east of the island.

XXVII. HALORAGÆ.

86. *MYRIOPHYLLUM*, Vaill.

143. *M. SPICATUM*, L. Water-Milfoil.

Common in the ponds around the island and in the lake.

144. *M. HETEROPHYLLUM*, Mx.

Abundant in the lake.

XXVIII. LYTHRACEÆ. Loosestrifes.

87. *LYTHRUM*, Linn.

145. *L. ALATUM*, Ph. Loosestrife.

I found this July 31, growing in marshy ground in the western part of the island near

the central lagoon where it occurs sparingly. N. 2½, W. 5. It is not given in Sullivant's "List of plants growing in the vicinity of Columbus," and there is no record of its having been found in the county.

88. *LUDWIGIA*, Linn.

146. *L. PALUSTRIS*, Ell. Water Purslane.

Common in the swamps and low ground around the island, especially from N. ½ to S. 1½, or in what is called the lower lagoon.

XXIX. *ONAGRACEÆ*. Evening—Primrose Family.

89. *EPILOBIUM*, Linn.

145. *E. COLORATUM*, Muhl.

Rather common about the lower lagoon and along the brook near the lake. August 17, 1882; July 30, 1887.

90. *CENOTHERA*, Linn.

148. *CE. BIENNIS*, L. Evening Primrose.

Sparingly in cultivated fields near the river, on the island and elsewhere. August 8, 1882; June 19, 1887; July 29, 1888.

149. *CE. BIENNIS*, L., var. *MURICATA*, Lindl.

This variety was found by Mr. Green in the summer of 1882.

91. *GAURA*, Linn.

150. *G. BIENNIS*, L. Gaura.

Not rare. May be found on the dike north of the island and along the river bank, N. 2½. August 8, 1882; July 29, 1888.

92. *CIRCEA*, Tourn.

151. *C. LUTETIANA*, L. Enchanter's Night-shade.

Found with the next species but is not so common. It grows in damp places near the river.

152. *C. ALPINA*, L. Enchanter's Night-shade.

Common in the eastern part of the woods near the fence, N. 2½. July 9, 1882.

XXX. *CUCURBITACEÆ*. Gourd Family.

93. *SICYOS*, Linn.

153. *S. ANGULATUS*, L. Star Cucumber.

Sparingly in damp, rich, shady grounds on the island, climbing over shrubs and small trees.

94. *ECHINOCYSTIS*, T. & G.

154. *E. LOBATA*, T. & G. Wild Cucumber.

Common in low grounds along the river, but rare except on the island. August 2, 1882. July 31, 1889.

XXXI. UMBELLIFERÆ. Parsley Family.

95. DAUCUS, Tourn.

155. D. CAROTA, L. Wild Carrot.

I found a single specimen along the brook just west of the lake, July 24, 1887, the first that has been found since 1882. S. 2, E. $\frac{1}{4}$.

96. HERACLEUM, Linn.

156. H. LANATUM, Mx. Cow Parsnip.

Rather abundant in the rich alluvial soil along the river and near the island. May 25, 1882; June 4, 1883; May 25, 1884; June 6, 1885; May 22, 1887; May 29, 1889.

97. PASTINACA, Linn.

157. P. SATIVA, L. Wild Parsnip.

Common in fence rows and in waste places along the river. June 11, 1882; May 28, 1884; June 6, 1885; May 29, 1887.

98. THASPIUM, Nutt.

158. T. AUREUM, Nutt. Meadow-Parsnip.

In clover meadow near the river. N. 1, W. $4\frac{1}{2}$. May 30, 1882; May 20, 1883; June 3, 1884; May 26, 1885; May 29, 1888; March 13, 1889.

99. PIMPINELLA, Linn.

159. P. INTEGERRIMA, B. & H. (*Zizia integrerrima*, D. C.) Golden Alexanders.

Sparingly in the clover field a little north of the road and near the lagoon. N. 1, W. $4\frac{1}{2}$. May 23, 1882; June 4, 1884; May 22, 1885; May 8, 1887; May 13, 1888.

100. CICUTA, Linn.

160. C. MACULATA, L. Water Hemlock.

Grows in wet places near the island, but is not commgn. June 2, 1883; June 12, 1887.

101. CHÆROPHYLLUM, Linn.

161. C. PROCUMBENS, Crantz. Wild Chervil.

Abundant in shady localities along the river; also along the south line fence. May 23, 1884; April 21, 1886; May 2, 1888; April 17, 1889.

102. OSMORRHIZA, Raf.

162. O. BREVISTYLIS, D. C. Hairy Sweet-cicely.

Two or three plants grow near the culvert on the west side of Neil avenue. May 12, 1882; May 30, 1887; May 27, 1888.

163. O. LONGISTYLIS, D. C. Smooth Sweet-cicely.

Very rare. River bank near the island spring where I found a single specimen this spring. N. $2\frac{1}{2}$, W. 3. May 26, 1885.

103. ERIGENIA, Nutt.

164. E. BULBOSA, Nutt. Pepper-and-Salt.

Rather common in the woods, and sparingly along the river. N. 2, E. 2½. March 4, 1882; April 7, 1883; April 21, 1884; April 17, 1885; March 7, 1886; March 27, 1887; April 7, 1888; March 17, 1889.

104. SANICULA, Tourn.

165. S. MARYLANDICA, L. var. CANADENSIS, Torr. Black Snake root.

Common in the western part of the island. N. 1½, W. 5¾. June 8, 1882; June 4, 1884; June 9, 1889.

XXXII. CORNACEÆ. Cornels.

105. CORNUS, Tourn.

166. C. FLORIDA, L. Flowering Dogwood.

There are two or three specimens on the campus; one is near the old tennis court, and another is west of the college building. May 5, 1883; May 12, 1884; May 28, 1885; May 3, 1887; May 8, 1888.

XXXIII. CAPRIFOLIACEÆ. Honeysuckles.

106. SAMBUCUS, Tourn.

167. S. CANADENSIS, L. Common Elder.

Common along the river and on the hillside south of horticultural hall. June 22, 1882; June 11, 1883; June 10, 1887; June 6, 1888; June 22, 1889.

XXXIV. RUBIACEÆ. Madder Family.

107. GALIUM, Linn.

168. G. APARINE, L. Cleavers.

Abundant in damp shady places, in the woods, south of the culvert, and near the river. May 6, 1882; May 16, 1883; May 23, 1884; May 21, 1885; May 5, 1887; May 2, 1888; April 28, 1889.

169. G. CIRCÆANS, Mx. Wild Liquorice.

Rather common in the woods.

170. G. CONCINNUM, T. & G.

Sparingly in the woods and on the island.

171. G. ASPRELLUM, Mx.

Common in the woods. August 9, 1882; June 12, 1887.

172. G. TRIFLORUM, Mx.

Occasionally found in the woods. June 8, 1884.

XXXV. VALERIANACEÆ. Valerians.

108. VALERIANELLA, Tourn.

- 173.
- V. WOODSIANA*
- , Walp, var.
- UMBILICATA*
- , Gray, (
- V. Umbilicata*
- , Sull.) Corn Salad.

Abundant in the low marshy ground, west of the lake, S. 2, E. $\frac{1}{2}$, and there is a small patch on the island, N. $1\frac{1}{2}$, W. 5. May 23, 1882; May 24, 1883; May 21, 1884; May 15, 1887.

XXXVI. DIPSACEÆ. Teaselworts.

109. DIPSACUS, Tourn.

- 174.
- D. SYLVESTRIS*
- , Mill. Teasel.

Abundant on the hillside south of the lake, where pure white specimens are occasionally found. S. 2, E. $\frac{1}{2}$. July 20, 1882; July 24, 1887; July 9, 1888.

XXXVII. COMPOSITÆ. Asterworts.

110. VERNONIA, Schreb.

- 175.
- V. NOVEBORACENSIS*
- , Willd. Iron Weed.

Common in low moist grounds and along fence rows. In pastures preferring a clay soil. Abundant on the hillside south of the lake. August 9, 1882; July 24, 1887.

111. EUPATORIUM, Tourn.

- 176.
- E. PURPUREUM*
- , L. Trumpet-weed.

Rare; one is occasionally seen in the jungle of weeds around the island. August 10, 1882; July 24, 1887.

- 177.
- E. SESSILIFOLIUM*
- , L. Upland Boneset.

Very rare. Mr. Green found a specimen in 1885. August 19, 1882.

- 178.
- E. PERFOLIATUM*
- , L. Boneset.

Common in moist places, along the brook east of the lake, and near the island. August 9, 1882; July 22, 1887.

- 179.
- E. AGERATOIDES*
- , L. f. White Snake-root.

Abundant in shady places, in the woods, near the lake, and on the island. August 11, 1882; August 27, 1887; August 28, 1888.

112. SOLIDAGO, Linn. Golden rod.

- 180.
- S. LATIFOLIA*
- , L.

Rare. There is a small cluster on the island, N. $1\frac{1}{2}$, W. $5\frac{1}{2}$. September 9, 1882; August 30, 1887.

- 181.
- S. SEROTINA*
- , Ait., var.
- GIGANTEA*
- , Gray. (
- S. gigantea*
- , Ait.)

Common on the island. August 11, 1882.

- 182.
- S. CANADENSIS*
- , L.

Grows on the island, but more sparingly than the above. September 23, 1882.

113. *ASTER*, Linn.

183. *A. NOVÆ ANGLIÆ*, L. New England Aster.
Common along the brook south of the lake. September 9, 1882; September 12, 1888.
184. *A. CORDIFOLIUS*, L.
Sparingly in the woods and on the island. September 13, 1882.
185. *A. MULTIFLORUS*, Ait.
Sparingly on the island.
186. *A. DIFFUSUS*, Ait. (*A. miser*, Ait.)
Common in waste places and on the island. September 14, 1882.
187. *A. LONGIFOLIUS*, Lam.
Occurs occasionally in the low marshy ground east of the island, but is not found without careful search.
188. *A. NOVI-BELGII*, L.
Grows sparingly along the brook south of the lake.
189. *A. PRENANTHOIDES*, Muhl.
Common along the brook. September 14, 1882.
190. *A. PUNICEUS*, L.
Rather common near the lake. September 9, 1882; September 15, 1885.

114. *ERIGERON*, Linn.

191. *E. BELLIDIFOLIUS*, Muhl. Robin's-plaintain.
Common near the lake swamp. May 14, 1882; June 4, 1883; May 8, 1887; June 6, 1888.
192. *E. PHILADELPHICUS*, L. Pink Fleabane.
Rather common about the lake. June 6, 1882; June 2, 1884; June 5, 1887.
193. *E. ANNUUS*, Pers. Tall Daisy.
Grows near the lake and in fields. June 5, 1884; June 8, 1887; June 9, 1888.
194. *E. STRIGOSUS*, Muhl. Daisy Fleabane.
Sparingly near Woodward avenue and elsewhere. June 2, 1883; June 8, 1884; June 8, 1887; June 9, 1888.
195. *E. CANADENSIS*, L. Mares-tails.
This vile weed is entirely too common in our pastures and along road sides. August 14, 1882.

115. *GNAPHALIUM*, Linn.

196. *G. DECURRENS*, Ives. Cudweed.
Grows sparingly on the campus, east of the botanical laboratory.

116. *SILPHIUM*, L.

197. *S. PERFOLIATUM*, L. Cup-plant.
Occurs sparingly along the river and on the island. There is a small clump on the campus near the stone. July 31, 1882; July 30, 1887.
198. *S. TRIFOLIATUM*, L. Rosin-weed.
Grows along the river and near the lake.

117. *AMBROSIA*, Tourn.

199. *A. TRIFIDA*, L. Horse-weed.

Very abundant around the island, where it grows luxuriantly and attains a large size. July 24, 1887; August 2, 1888.

200. *A. ARTEMISIFOLIA*, L. Rag-weed.

Very common in fields and waste places. August 9, 1882; August 12, 1887; August 2, 1888.

118. *XANTHIUM*, Tourn.

201. *X. CANADENSE*, Mill. (*X. strumarium*, L.) Clot-weed.

Common along the brook. September 7, 1882; August 27, 1887.

119. *HELIOPSIS*, Pers.

202. *H. LÆVIS*, Pers. Ox-eye.

Rather abundant along the river just south of the road and nearly west of the big box elder, S. 1½, W. 5. July 11, 1882.

120. *ECHINACEÆ*, Mœench.

203. *E. PURPUREA*, Mœench. Purple Cone-flower.

Mr. Green found this growing along the river. July 29, 1882.

121. *RUDBECKIA*, Linn.

204. *R. TRILOBA*, L. Cone-flower.

Grows along the river. August 9, 1882.

205. *R. HIRTA*, L. Yellow Daisy.

Grows in the meadow south of the road and near the river. September 9, 1882; June 12, 1887; June 23, 1889.

206. *R. SPECIOSA*, Wender.

Sparingly east of the island and north of road.

207. *R. LACINIATA*, L. Cone-flower.

Grows in the clover field near the island. August 8, 1882.

122. *HELIANTHUS*, Linn.

208. *H. LÆTIFLORUS*, Pers.

A little east of the island. August 15, 1882.

209. *H. DIVARICATUS*, L.

Abundant along the brook near the lake.

210. *H. HIRSUTUS*, Raf.

Near the northern part of the island. August 8, 1882.

211. *H. STRUMOSUS*, L.

Along the river near the island.

212. *H. TRACHELIIFOLIUS*, Willd.

This and the following species grow on the island.

213. H. DECAPETALUS, L.

Grows along the river; not so common as the above.

123. ACTINOMERIS, Nutt.

214. A. SQUARROSA, Nutt. Actinomeris.

Along the river north of the road leading to the island, S. 1½, W. 4½. August 8, 1882.

124. BIDENS, Tourn.

215. B. FRONDOSA, L. Stick-tight.

Common in meadow near river. September 7, 1882.

216. B. CHRYSANTHEMOIDES, Mx. Begger-Ticks.

Abundant along the brook near the lake, but sparingly along the river. September 4, 1882; July 17, 1887.

217. B. BIPINNATA, L. Spanish Needles.

Common in the woods and in the meadow west of the barn. August 15, 1882; August 21, 1887.

125. HELENIUM, Linn.

218. H. AUTUMNALE, L. Sneeze-weed.

Along the river south of the road and west of the big box elder. S. 1½, W. 5. August 20, 1882.

126. ANTHEMIS, Linn.

219. A. COTULA, D. C. (*Marula cotula*, DC.) May-weed.

Abundant in the yard of the larger dormitory, and on west Woodruff avenue; occasionally elsewhere, as it is spreading slowly. June 22, 1882; June 11, 1887.

127. ACHILLEA, Vaill.

220. A. MILLIFOLIUM, L. Yarrow.

Common in fields and on the hillside over the lake. June 22, 1882; May 30, 1887; June 6, 1888; June 1, 1889.

128. CHRYSANTHEMUM, Tourn.

221. C. LEUCANTHEMUM, L. (*Leucanthemum vulgare*, Lam.) White Daisy.

Very rare. I found a single specimen near the swamp west of the lake. Mr. Devol found it on the campus in 1882. June 14, 1882; July 10, 1887.

129. TANACETUM, Tourn.

222. T. VULGARE, L. Tansy.

In Dr. Townshend's front yard, and in the grass-plot field north of Prof. Thomas' house, N. ¼, E. 3. June 7, 1884; July 10, 1887.

130. SENECIO.

223. S. AUREUS, L. Golden Rag-wort.

There is quite a patch on the bank a little north of the island spring, N. 2½, W. 3. April 30, 1882; May 5, 1883; May 14, 1884; April 21, 1886; April 25, 1887; April 23, 1888.

131. CACALIA, Linn.

224. C. ATRIPPLICIFOLIA, L. Indian Plantain.

There is a clump of about a dozen plants growing on the dike west of the island, N. 3, W. 5. August 11, 1882; July 31, 1889.

132. ERECHTHITES, Raf.

225. E. HIERACIFOLIA, Raf. Fire-weed.

Scarce. A few specimens have been found near the lake, about the culvert and in the woods.

133. ARCTIUM, Linn.

226. A. LAPPA, L. (
- Lappa major*
- , Gærtn.) Burdock.

Common in waste places, yards and in old fence rows. Some very large specimens grow near the culvert and on the hillside south of the lake. July 20, 1882; July 21, 1887; June 25, 1888.

134. CNICUS, Tourn. (*Cirsium*, D C.)

227. C. ARVENSIS, Hoffm. Canada Thistle.

Occurs in only one place on west Woodruff avenue along the roadside; as it is just north of a clover field it seems probable that it was introduced in unclean clover seed. The plants have been dug up several times, and as I have seen nothing of them this spring the weed has probably disappeared from our limits.

228. C. LANCEOLATUS, Hoffm. Common Thistle.

Common in pasture fields. July 11, 1882; July 10, 1889.

229. C. ALTISSIMUS, Willd.

Abundant on the south side of the dike, N. 3 $\frac{1}{2}$, W. 3 $\frac{1}{2}$. August 17, 1882.

135. CENTAUREA, Linn.

230. C. CYANUS, L. Bluebottle.

Two years ago I found several specimens growing near the athletic track and this spring I found it there again, and also near the old drive to the botanical building. It is also found east of the mechanical laboratory. S. $\frac{1}{2}$, E. 2. July 8, 1889.

136. TRAGOPOGON, Linn.

231. T. PORRIFOLIUS, L. Salsify.

Escaped from cultivation in the grass-plot field and south of the garden near the culvert. May 29, 1882; June 3, 1884; May 27, 1887. A variety with yellow flowers was found in the former locality which perhaps runs into

232. T. PRATENSIS, L. Goat's-Beard.

A single specimen of which was found May 27, 1889.

137. HIERACIUM, Tourn.

233. H. SCABRUM, Mx. Rough Hawkweed.

Ernest Evans found a flower last August in the meadow near the river which he thought was the above species. August 28, 1882; July 9, 1888.

138. *PRENANTHES*, Vaill. (*Nabalus*, Cass.)

- 234.
- P. ALBA*
- , L. (
- Nabalus albus*
- , Hook.) White Lettuce.

Found by Mr. Green August 19, 1882.

- 235.
- P. SERPENTARIA*
- , Pursh. (
- N. albus*
- , Hook. var.
- serpentaria*
- .)

Occasionally met with in the woods northeast of the island, but is quite rare.

- 236.
- P. ALTISSIMA*
- , L. (
- N. altissimus*
- , Hook.)

Sparingly on the hillside near the nursery.

139. *TARAXACUM*, Haller.

- 237.
- T. OFFICINALE*
- , Weber. (
- T. dens-leonis*
- , Desf.) Dandelion.

Abundant everywhere in meadows and pastures. April 12, 1882; April 30, 1883; May 14, 1884; April 30, 1885; April 14, 1886; April 11, 1887; April 5, 1888; April 9, 1889.

140. *LACTUCA*, Tourn.

- 238.
- L. SCARIOLA*
- , L. Wild Lettuce.

Sparingly about the culvert, but is spreading rapidly and is now found in several places along road sides. July 9, 1882.

- 239.
- L. CANADENSIS*
- , L. Trumpet Weed.

On the hillside near the nursery and in the grass-plot field along the fence. July 8, 1887; July 1, 1888; June 22, 1889.

- 240.
- L. INTEGRIFOLIA*
- , Bigel. (
- L. canadensis*
- , L. var.
- integrifolia*
- , Gr.)

Rare; on the bank of the brook west of the culvert, and also west of the barn to the river.

- 241.
- L. HIRSUTA*
- , Muhl. (
- L. sanguinea*
- , Bw.)

On the hillside; not common.

- 242.
- L. FLORIDANA*
- , Gært. (
- Mulgedium floridanum*
- , D. C.)

Near the river and in fields.

- 243.
- L. LEUCOPHAEA*
- , Gray. (
- Mulgedium leucophaeum*
- , D. C.)

Grows on the hillside and near the river. The flowers vary in color, being blue, yellow or white. October 4, 1882, W. C. Mills and J. C. Erskine found in the woods, near the river, a specimen 15 feet 9 inches high.

141. *SONCHUS*, Tourn.

- 244.
- S. ASPER*
- , Vill.* Sow-Thistle.

Not common; grows on the hillside and near the culvert. July 11, 1882; June 19, 1887.

XXXVIII. LOBELIACEÆ. Lobelia Family.

142. *LOBELIA*, L.

- 245.
- L. SYPHILITICA*
- , L. Great Lobelia.

Common in the low meadow land along the brook south and east of the lake. August 12, 1887.

- 246.
- L. INFLATA*
- , L. Indian Tobacco.

Not common; in the pasture east of the woods, where it was recently introduced. August 10, 1882.

XXXIX. CAMPANULACEÆ. Campanula Family.

143. SPECULARIA, Heister.

247. S. PERFOLIATA, A. D. C. Venus's Looking-glass.

Very rare. A few specimens were found this spring near the shelter of Norway Spruce, north of the garden. The only other locality near the city is a common lying between High and Summit streets and southeast of the N. Columbus Tile works. It is gradually dying out and the the locality will soon be lost.

144. CAMPANULA, Tourn.

248. C. AMERICANA, L. Tall Bellflower.

Common along the river and about the island. July 11, 1882; August 10, 1887.

XL. PRIMULACEÆ. Primrose Family.

145. STEIRONEMA, Raf.

249. S. CILIATUM, Raf. (*Lysimachia ciliata*, L.)

Occurs sparingly, found only on the bank near the island spring. July 11, 1882; June 19, 1887.

146. LYSIMACHIA, Tourn.

250. L. MUMMULARIA, L. Moneywort.

This plant is not given in Beardslee's "Catalogue of the Plants of Ohio," but has been recently introduced. A year or two ago there was a small patch of it growing in the western part of the campus, southwest of the main building.

XLI. OLEACEÆ. Olives.

147. FRAXINUS, Tourn.

251. F. AMERICANA, L. White Ash.

On the campus and in the woods. May 15, 1883; May 5, 1884; April 23, 1885; April 17, 1887; April 16, 1889.

252. F. QUADRANGULATA, Mx. Blue Ash.

There are two or three specimens on the campus. April 17, 1887.

253. F. SAMBUCIFOLIA, Lam. Black Ash.

Common in the woods and along the river. April 15, 1882; April 23, 1884; May 16, 1885.

XLII. APOCYNACEÆ. Dog-hanes.

148. APOCYNUM, Tourn.

254. A. CANNABINUM, L. Indian Hemp.

Common on the island, where it is quite variable in form. One form approaches

closely var. *hypericifolium*. (*A. hypericifolium*, Ait.) July 9, 1882; May 17, 1887; June 22, 1889.

XLIII. ASCLEPIADACEÆ. Milkweeds.

149. ASCLEPIAS, L.

255. *A. INCARNATA*, L. Swamp Milkweed.

Sparingly along the brook near the lake and northeast of the island. June 25, 1887.

256. *A. CORNUTI*, Dec. Common Milkweed.

Rather common along the brook and in fields near the river. July 9, 1882; June 19, 1887; June 21, 1888.

XLIV. POLEMONIACEÆ.

150. PHLOX, Linn.

257. *P. PANICULATA*, L.

Along the river south of the brook, and on the island.

258. *P. MACULATA*, L. Wild Sweet-William.

Same situation as the above, not abundant. July 11, 1882; July 24, 1887; July 29, 1888.

258. a. *P. maculata*, L. var. *candida*, Mx. Is a white variety, occasionally met with on the island. It differs from the type in having no spots.

259. *P. DIVARICATA*, L.

Common in the woods, but rarely found elsewhere. Some have pure white flowers and the color seems to be constant from year to year; at least we find white ones in the same place each season. April 27, 1883; April 30, 1884; May 10, 1885; April 19, 1886; April 14, 1887; April 21, 1888; April 9, 1889.

151. POLEMONIUM, Tourn.

260. *P. REPTANS*, L. Greek Valerian.

Sparingly along the fence from the seed barn to the river. April 18, 1882; May 5, 1883; May 5, 1884; May 12, 1885; April 23, 1887; April 20, 1889.

XLV. HYDROPHYLLACEÆ. Hydrophylls.

152. HYDROPHYLLUM, Tourn.

261. *H. MACROPHYLLUM*, Nutt.

Sparingly along the river, south of the brook and on the bank northeast of the island. June 4, 1884; June 2, 1885; May 26, 1887.

262. *H. VIRGINICUM*, L. Water-leaf.

Rare, found only in the woods northeast of the island, N. $3\frac{1}{4}$; W. $3\frac{1}{2}$. May 23, 1882; May 31, 1884; May 14, 1887. Occurs also on the Scioto near Hayden's Falls.

263. *H. CANADENSE*, L.

There are a few specimens in the woods. May 20, 1883. It is a rare plant and I know of no other locality near Columbus.

264. *H. APPENDICULATUM*, Mx.

Abundant along the river south of the brook. May 15, 1882; May 15, 1884; May 26, 1885; May 4, 1889.

153. *PHACELIA*, Juss.265. *P. PURSHII*, Buckley. (*Cosmanthus purshii*, Buck.) Miami Mist.

Abundant northwest of the garden along the fence, S. $\frac{1}{4}$, W. $1\frac{5}{8}$, and near the seed barn, where it is spreading rapidly. May 23, 1882; June 4, 1883; May 20, 1884; May 8, 1887; June 3, 1888.

XLVI. BORRAGINACEÆ. Borageworts.

154. *CYNOGLOSSUM*, Tourn.266. *C. OFFICINALE*, L. Hound's-Tongue.

Sparingly along west Woodward avenue. May 18, 1882; May 14, 1883; May 21, 1884; May 26, 1885; May 15, 1887.

155. *ECHINOSPERMUM*, Lehm.267. *E. VIRGINICUM*, Lehm. (*Cynoglossum morrisoni*, D C.) Beggar's Lice.

In the woods, not common, usually in the eastern part, near the fence, also on the island. August 10, 1882.

156. *MERTENSIA*, Roth.268. *M. VIRGINICA*, D C. Smooth Lungwort.

It is still found on the island, but is gradually dying out. N. 1, W. 5. April 14, 1882; May 5, 1883; April 20, 1884; May 3, 1885; April 19, 1886; April 17, 1887; April 26, 1888; April 20, 1889.

156. *LITHOSPERMUM*, Tourn.269. *L. ARVENSE*, L. Wheat Thief.

A very abundant weed in fields and pastures. April 18, 1882; April 28, 1883; April 19, 1884; April 27, 1885; April 17, 1886; April 15, 1887; April 17, 1888; April 9, 1889.

270. *L. ————*.

An undetermined species found May 31, a little southeast of the seed barn near a lombardy poplar; only a few specimens were found. Perhaps only a depauperate form of the above.

XLVII. CONVULVULACEÆ. Bindweeds.

158. *IPOMOEA*, Linn.271. *I. PANDURATA*, Meyer. Wild Morning Glory. Man-of-the-Earth.

There are several specimens on the island growing on the dike west of the large lagoon which divides the island, N. $2\frac{1}{4}$, W. $5\frac{1}{4}$. July 21, 1889. The only locality known in the county.

159. CONVULVULUS, Linn.

- 272.
- C. SEPIUM*
- , L. (
- Calystegia sepium*
- , R. Br.) Hedge Bindweed.

Common in the meadow near the river; a bad weed in cultivated fields. July 11, 1882; June 17, 1888.

- 273.
- C. ARVENSIS*
- , L. Bindweed.

This plant, which is not given in Beardslee's "Catalogue of the Plants of Ohio," was recently introduced and is now growing sparingly on the campus southwest of the college where it is spreading rapidly. W. °. S. $\frac{1}{2}$. June 15, 1887. The only other locality is the common southeast of the tile works.

160. CUSCUTA, Tourn.

274. *
- C. GRONOVII*
- , Willd. Dodder.

Sparingly along the river, growing on the stems of salix and aster. S. 10, W. $5\frac{1}{2}$.

- 275.
- C. GLOMERATA*
- , Choisy. Dodder.

On the hillside southwest of horticultural hall, S. $2\frac{1}{2}$, E. $1\frac{1}{2}$.

XLVIII. SOLANACEÆ. Nightshades.

The tomato (*Lycopersicum esculentum*, Mill.) is occasionally found growing in waste places on the island where the seed has been dropped by birds. N. $1\frac{1}{2}$, W. 5; also S. $1\frac{1}{2}$, W. $5\frac{1}{2}$. July 15, 1882; June 2, 1884; June 6, 1885.

161. SOLANUM, Tourn.

- 276.
- S. DULCAMARA*
- , L. Bitter-sweet.

Near the lake, along the brook, and on the island, but is not common. June 3, 1884; May 22, 1887; June 9, 1888.

- 277.
- S. NIGRUM*
- , L. Nightshade.

Frequent on the campus north of horticultural hall, and elsewhere. July 9, 1882; June 10, 1887; July 9, 1888.

162. PHYSALIS, Linn. Ground Cherry.

- 278.
- P. PHILADELPHICA*
- , Lam.

In dry pastures and on the campus. August 4, 1882.

- 279.
- P. VISCOSA*
- , L.

Common on the campus southeast of the college. July 9, 1882; June 23, 1888; June 5, 1889.

163. DATURA, Linn.

- 280.
- D. STRAMONIUM*
- , L. Thorn Apple.

Common along the brook and in waste places. June 15, 1887.

- 281.
- D. TATULA*
- , L. Purple Thorn-Apple.

This is rather more common than the last, and is found near the barn and on the island, N. 3, W. $4\frac{1}{2}$. June 20, 1888.

XLIX. SCROPHULARIACEÆ.

164. VERBASCUM, Linn.

282. V. THAPSUS, L. Mullein.

Not very common, in fields and pastures. June 22, 1882; June 25, 1884; June 29, 1887; July 1, 1888.

283. V. BLATTARIA, L. Moth Mullein.

This was recently introduced, probably in impure clover seed; six years ago there was none on the grounds, now it is becoming abundant in the pasture east of the woods, along Woodward avenue, and elsewhere, N. 2 $\frac{1}{2}$, E. 4. June 20, 1887; June 6, 1888; June 17, 1889.

165. LINARIA, Tourn.

284. L. VULGARIS, Mill. Toad-flax. Butter and Eggs.

This also has been recently introduced, as up to two years ago I had found none on the farm, although Mr. Devol found a specimen in 1882. Last summer there was a small clump on Neil avenue just north of the gate, S. 3 $\frac{1}{2}$, E. $\frac{1}{4}$. It is not common in the vicinity of Columbus. July 20, 1887; June 12, 1888.

166. SCROPHULARIA, Tourn.

285. S. NODOSA, L. var. MARILANDICA, Gray. Figwort.

Not common; grows sparingly on the island north of the road, S. 1 $\frac{1}{8}$, W. 4 $\frac{1}{8}$, and elsewhere. July 29, 1888.

167. COLLINSIA, Nutt.

286. C. VERNA, Nutt. Innocence.

This pretty little plant used to grow on the island near the dike. It never was common, and since the island was cleared off it has become very rare. April 17, 1882; May 5, 1883; May 10, 1884; May 24, 1885; April 28, 1887; April 29, 1889.

168. PENSTEMON, Mitchell.

287. P. PUBESCENS, Sol. Beard-tongue.

Ernest Evans found this last summer in a meadow near the river. June 10, 1884; May 30, 1887.

169. MIMULUS, Linn.

288. M. RINGENS, L. Monkey-flower.

Rather common along the island lagoons. July 31, 1882; July 30, 1887.

170. ILYSANTHES, Raf.

289. I. RIPARIA, Raf. (*I. gratioloides*, Benth.) False Pimpernel.

Last fall I found a few specimens growing on the river bank north of the dyke in the extreme northwest corner of the farm.

171. VERONICA, Linn.

290. V. ANAGALLIS, L. Water Speedwell.

Several large specimens were found last summer in the small swamp west of the lake.

291. *V. AMERICANA*, Sch. Brook-Lime.

Along the bank of the lake and near the brook. July 8, 1887.

292. *V. SCUTELLATA*, L. Marsh Speedwell.

Occurs sparingly in a small bog in the western part of the island and north of the duck pond, N. 2½, W. 5.

293. *V. OFFICIALIS*, L. Common Speedwell.

Common in the southwestern part of the woods and occasionally found on the campus.

294. *V. SERPYLLIFOLIA*, L. Thyme-leaved Speedwell.

In cultivated ground, common north of the garden and west of the seed barn. April 30, 1882; May 22, 1885; July 10, 1887.

295. *V. PEREGRINA*, L. Neckweed.

In same localities as the above, but rarer. May 12, 1884; May 7, 1887; May 10, 1888; April 29, 1889.

296. *V. ARVENSIS*, L. Corn Speedwell.

Common on the campus and in pastures. April 30, 1882; June 7, 1884; May 10, 1887. Several specimens of a depauperate form were found this spring on the hillside just west of the horticultural hall, S. 1½, E. 1½.

172. *SEYMERIA*, Pursh.

297. *S. MACROPHYLLA*, Nutt. Mullein Foxglove.

This was found on the farm along the river by Mr. W. J. Green, July 27, 1882, and has not been reported since.

173. *GERARDIA*, Linn.

298. *G. TENUIFOLIA*, Vahl. Slender Gerardia.

Common in moist situations east of the island, S. ½, W. 4½. August 17, 1882; August 28, 1887.

L. OROBANCHACEÆ. Broomrapes.

174. *EPIPHEGUS*, Nutt.

299. *E. VIRGINIANA*, Bart. Beech-drops.

Rare; grows in moist shady places in the woods, on or near the roots of beech trees. September 9, 1882; October 2, 1887.

LI. BIGNONIACEÆ.

175. *CATALPA*, Scop.

300. *C. BIGNONIOIDES*, Walt.

There was a small grove of these trees set out on the west side of the island near the river several years ago, which seem to be well established. June 15, 1887; June 18, 1888; June 20, 1889.

LII. ACANTHACEÆ. Acanthads.

176. *RUELLIA*, Plumier.

301. *R. STREPENS*, L.

Rare; in the eastern part of the woods and on the island north of turn in the road, S. ½, W. 5½. August 15, 1882; June 19, 1887.

177. DIANTHERA, Gronov.

- 302.
- D. AMERICANA*
- , L. Water-willow.

Abundant in the water all along the river. July 15, 1882.

LIII. VERBENACEÆ. Vervains.

178. VERBENA, Tourn.

- 303.
- V. URTICÆFOLIA*
- , L. White Vervain.

Common along the river and in the woods. July 15, 1882; July 30, 1887.

- 304.
- V. HASTATA*
- , L. Blue Vervain.

This is found with the above but is not so common. July 27, 1882; June 25, 1887.

179. LIPPIA, Houst.

- 305.
- L. LANCEOLATA*
- , Mx. Fog-fruit.

Abundant in the lake swamp, in the meadow south of Prof. Thomas' house near the bridge, S. 1 $\frac{1}{2}$, E. 3 $\frac{1}{2}$, and occasionally elsewhere as it is spreading rapidly. July 10, 1882; July 5, 1887.

180. PHRYMA, Linn.

- 306.
- P. LEPTOSTACHYA*
- , L. Lop-seed.

Common in the woods and about the island.

LIV. LABIATÆ. The Mints.

181. TEUCRIUM, Tourn.

- 307.
- T. CANADENSE*
- , L. Germander.

Mr. W. J. Green found this July 11, 1882. It grows sparingly along the brook and east of the island where I collected specimens last summer.

182. COLLINSONIA, Linn.

- 308.
- C. CANADENSIS*
- , L. Horse Balm.

I found a single specimen last August in the western part of the island near the catnip grove.

183. MENTHA, Tourn.

- 309.
- M. PIPERITA*
- , L. Peppermint.

Along the brook east of the lake, and sparingly about the island. August 2, 1882.

- 310.
- M. ARVENSIS*
- , L. Field Mint.

Along the brook and near the river. August 11, 1882.

- 311.
- M. CANADENSIS*
- , L. Horsemint.

Around the lagoon north of the road, S. 1 $\frac{1}{4}$, W. 4 $\frac{1}{4}$. August 9, 1882.

184. LYCOPUS, Tourn.

- 312.
- L. SINUATUS*
- , Ell. (
- L. Europæus*
- , L. var.
- sinuatus*
- , Gr.) Water Hoarhound.

Common in moist places along the lagoons near the island. August 10, 1882.

185. HEDEOMA, Pers.

- 313.
- H. PULEGIOIDES*
- , Pers. Pennyroyal.

Sparingly in the meadow east of the woods. August 15, 1882.

186. MONARDA, Linn.

314. M. FISTULOSA, L. Wild Bergamot.

Common in the woods and on the island, N. 2 $\frac{3}{4}$, W. 3 $\frac{1}{4}$. July 9, 1882; July 8, 1887.

187. BLEPHILA, Raf.

315. B. HIRSUTA, Benth.

In the eastern part of the woods near the fence, but not so common as the above.
July 19, 1882.

188. LOPHANTHUS, Benth.

316. L. NEPETOIDES, Benth. Giant Hyssop.

Sparingly in the woods around the island. August 8, 1882; June 8, 1884; August 21, 1887.

189. NEPETA, Linn.

317. N. CATARIA, L. Catnip.

Common in waste places and in fence rows. July 8, 1882; June 29, 1887.

318. N. GLECHOMA, Bent. Ground Ivy.

Very abundant everywhere, in the woods, along the brook, and around the island.
April 20, 1882; April 30, 1883; April 23, 1884; May 5, 1885; April 17, 1886; April 11, 1887; April 10, 1888; April 4, 1889.

190. SCUTELLARIA, Linn.

319. S. LATERIFLORA, L. Mad-dog Skull-cap.

Mr. W. J. Green found this August 10, 1882.

320. L. VERSICOLOR, Nutt.

On the banks of the ponds around the island. July 9, 1882.

321. S. GALERICULATA, L. Common Skull-cap.

Near the lake, growing in shaded places. August 9, 1882; June 13, 1887.

191. BRUNELLA, Tourn.

322. B. VULGARIS, L. Heal-all.

Grows in the woods and near the lake. June 18, 1887.

192. PHYSOSTEGIA, Benth.

323. P. VIRGINIANA, Benth. Lion's heart. False Dragon-head.

I found a small cluster this spring on a peninsula in the swamp northeast of the island.
N. 3 $\frac{1}{2}$, W. 4 $\frac{1}{2}$. August 17, 1882.

193. LEONURUS, Linn.

324. L. CARDIACA, L. Motherwort.

Common in fields and waste places. June 11, 1882; June 7, 1884; May 29, 1887;
June 9, 1888.

194. LAMIUM, Tourn.

325. L. AMPLEXICAULE, L. Dead-Nettle.

Common along the fence west of the seed barn, and elsewhere. April 19, 1882; April 28, 1883; April 28, 1884; May 7, 1885; April 15, 1887; May 1, 1888; April 19, 1889.

195. STACHYS, Tourn.

326. S. PALUSTRIS, L. Hedge Nettle.

Common along the brook near the lake. July 9, 1882; July 10, 1887; July 1, 1888.

327. S. ASPERA, Mx. (*S. Palustris*, L., var. *aspera*, Gray.) Hedge Nettle.

This was found on the island last summer. August 11, 1882; June 7, 1884; May 29, 1887; June 9, 1888.

328. S. ASPERA, Mx. var GLABRA, Gray. (*S. glabra*, Rid.)

Grows sparingly along the river. July 27, 1882.

LV. PLANTAGINACEÆ Plantains.

196. PLANTAGO, Tourn.

329. P. MAJOR, L. Common Plantain.

Occurs sparingly near the dormitory.

330. P. RUGELII, Decais. (*P. kantschatica*, Gray.)

Common in fields, roadsides, along fences; also in yards, e. g., around the dormitory. It is frequently mistaken for the above. July 8, 1882; June 17, 1887; July 5, 1888.

331. P. LANCEOLATA, L. Narrow-leaved Ribwort.

Common on the campus and in fields. June 8, 1882; May 8, 1887; May 30, 1888.

332. P. PATAGONICA, Jacq. var. ARISTATA, Gray. (*P. aristata*, Mx.) Bearded Plantain.

Rare. There is quite a patch northwest of the college near the seed barn. It was recently introduced from the west in impure grass seed and is now spreading rapidly. Two years ago there was another patch east of the walk from the college to the spring, but this was dug up on account of its aggressive habits. July 9, 1882; July 5, 1887.

LVI. ILLECEBRACEÆ.

197. ANYCHIA, Mx.

333. A. DICHOTOMA, Mx. Forked Chickweed.

Last fall I found some plants in the northwestern corner of the island which resemble closely the specimen in the university herbarium. N. 3½, W. 4½. This plant is rather rare, but specimens may also be found in the North Columbus run.

LVII. AMARANTACEÆ. Amaranths.

198. AMARANTUS, Tourn.

334. A. RETROFLEXUS, L. Pigweed.

Common in fields and pastures. September 4, 1882; August 2, 1888.

335. *A. ALBUS*, L. Tumble weed.

A few specimens have been found west of Neil avenue south of the garden, and in the dormitory yard. August 12, 1887.

LVIII. CHENOPODIACEÆ. Goose-foots.

199. *CHENOPODIUM*, Tourn.

336. *C. ALBUM*, L. Pigweed.

Occurs sparingly near the garden and elsewhere. August 28, 1887.

LIX. PHYTOLACCACEÆ. Pokeworts.

200. *PHYTOLACCA*, Tourn.

337. *P. DECANDRA*, L. Pokeweed.

There is a specimen near horticultural hall and a few about the island. July 11, 1882; June 16, 1887; June 9, 1888; June 10, 1889.

LX. POLYGONACEÆ. Sorrelworts.

201. *RUMEX*, Linn.

338. *R. VERTICILLATUS*, L. Swamp Dock.

Common in moist places near the river. March 30, 1887; June 9, 1888.

339. *R. CRISPUS*, L. Yellow Dock.

Common in fields and pastures. June 7, 1884; May 25, 1887.

340. *R. OBTUSIFOLIUS*, L. Bitter Dock.

Not common; near the river and along the brook; occasionally along roadsides. Some specimens have red-veined radical leaves. May 30, 1887; June 3, 1888.

341. *R. ACETOSELLA*, L. Sheep Sorrel.

Very abundant everywhere in fields and pastures. May 15, 1882; May 14, 1883; June 7, 1884; May 7, 1887; April 24, 1889.

202. *POLYGONUM*, Tourn. Knot-weed.

342. *P. AVICULARE*, L. Knot-grass.

Common on the campus and along roads.

343. *P. ERECTUM*, L., (*P. aviculare*, L., var. *erectum*, Roth.)

Rather common along roadsides and in waste places.

344. *P. HYDROPIPEROIDES*, Mx. Mild Water-pepper.

Common south of the road leading to the island and in damp places. July 15, 1882.

345. *P. HYDROPIPER*, L. Smartweed. Water-Pepper.

Common along the river.

346. *P. ACRE*, H. B. K.

Grows in waste places near the river.

347. *P. VIRGINIANUM*, L.

Common in moist shady places along the river. August 8, 1882.

348. *P. CONVULVULUS*, L. Black Bindweed.

Common in fields. July 15, 1882.

349. *P. DUMETORUM*, L. var. *SCANDENS*, Gray. Climbing False Buckwheat.

Abundant near the river in cultivated ground. August 17, 1882.

LXI. PIPERACEÆ. Peppers.

203. *SAURURUS*, Linn.350. *S. CERNUUS*, L. Lizard's-tail.

North of the island. N. $3\frac{1}{2}$, W. $3\frac{1}{2}$. Not abundant. July 19, 1882.

LXII. LAURACEÆ. Laurels.*

204. *LINDERA*, Thunb.351. *L. BENZOIN*, Blume. Spice-bush.

There are two bushes growing along the brook south of the lake. April 24, 1882; April 16, 1883; April 15, 1888; April 2, 1889.

LXIII. EUPHORBIACEÆ. Spurgeiworts.

205. *EUPHORBIA*, Linn. Spurge.352. *E. MACULATA*, L.

It is most abundant near the new chemical laboratory. July 3, 1887.

353. *E. PRESLI*, Guss. (*E. hypericifolia*, L.)

This and the preceding species are abundant on the campus, mostly to east of $1\frac{1}{2}$ E. but west of 3 E. and between $1\frac{1}{2}$ N. and $1\frac{1}{2}$ S. They are quite variable. July 27, 1882; July 1, 1887; August 3, 1888.

354. *E. PEPLUS*, L.

This is an eastern plant which I have never seen about Columbus. The specimen in the university herbarium (Devol, April 17, 1882) is undoubtedly *E. commutata*, Eng. Beardslee's "Catalogue of Ohio Plants," says "Columbus Sull.," and it is given in Sullivant's "List of Plants Growing in the vicinity of Columbus." I have compared my specimens collected in various parts of the county with authentic specimens from Cornell University herbarium, and carefully examined the seeds, and find all my plants to be *E. commutata*, Eng. Prof. W. R. Dudley, to whom I submitted specimens, confirms me in this opinion.

355. *E. COMMUTATA*, Engelm.

Rare; I found a few specimens April 19, 1889, on a moist bank south of the island spring, and a week later I found it growing on the island near the west dike. It is abundant just across the river from the last locality. N. $2\frac{1}{2}$, W. $2\frac{1}{2}$. April 15, 1882; May 13, 1883; May 6, 1884; June 2, 1885; May 5, 1888; April 19 1889. This is not common

**Sassafras officinale*, Nees. There is a single tree growing on the campus near the old tennis court, the only one I know of in the county.

about Columbus, but is very abundant on the rocky banks of the Scioto river three miles west of the city and north of Arlington. It is not given in Beardslee's "Catalogue of the Plants of Ohio," nor in Sullivan's "List of Plants growing in the vicinity of Columbus," though the above species is mentioned by both. This causes me to think that the two species have been confounded with one another.

206. ACALYPHA, Linn.

356. A. VIRGINICA, L. Three-seeded Mercury.

Common in damp shady places, west of the lake and elsewhere.

LXIV. URTICACEÆ. Nettle Family.

207. ULMUS, Linn.

357. U. FULVA, Mx. Slippery Elm.

There are several trees in the woods and along the river. April 11, 1883; April 23, 1885; March 22, 1889.

358. U. AMERICANA, L. White Elm.

Common on the campus and in the woods. April 14, 1883; April 23, 1885; March 12, 1887; March 30, 1888; March 18, 1889.

359. U. RACEMOSA, Thomas. Corky Elm.

There is a specimen along the river west of the university.

208. CELTIS, Tourn.

360. C. OCCIDENTALIS, L. Hackberry.

Common in the woods and along the river. May 1, 1889.

209. HUMULUS, Linn.

361. H. LUPULUS, L. Hop-vine.

Not rare; on the island in the northwest corner and growing on the south line fence. It has been growing wild on the island for some years.

210. MACLURA, Nutt.

462. M. AURANTICA, Nutt. Osage Orange.

There are several specimens in front of Dr. Townshend's house, S. 4, E. 5½. June 15, 1884; May 30, 1887.

211. MORUS, Tourn.

363. M. RUBRA, L. Red Mulberry.

There are three trees in the woods and a few near the river east of the island. May 21, 1884; May 26, 1885; May 22, 1887; May 12, 1888.

212. URTICA, Tourn.

364. U. DIOICA, L. Stinging Nettle.

Very abundant along the river. July 29, 1889.

213. LAPORTEA, Gaud.

365. L. CANADENSIS, Gaud. Wood Nettle.

Common in the southern part of the island. August 8, 1882.

214. *PILEA*, Lindl.

- 366.
- P. PUMILA*
- , Gray. Rich-weed. Clearweed.

Rather common about the lake.

215. *BEHMERIA*, Jacq.

- 367.
- B. CYLINDRICA*
- , Willd. False Nettle.

On the island, but rare. N. 1, W. $5\frac{1}{3}$. August 10, 1882.

216. *PARIETARIA*, Tourn.

- 368.
- P. PENNSYLVANICA*
- , Muhl. Pellitory.

Common just west of the lake and in damp shady places.

LXV. *PLATANACEÆ*. Sycamores.217. *PLATANUS*, Linn.

- 369.
- P. OCCIDENTALIS*
- , L. Button Wood. Sycamore.

Very common on the campus and along the river; some attain a large size, one being 130 feet high and 18 feet in circumference four feet above the ground.

LXVI. *JUGLANDACEÆ*. Walnuts.218. *JUGLANS*, Linn.

- 370.
- J. CINEREA*
- , L. Butternut.

There are several trees in the woods, and a few along the river north of the road. May 14, 1884; May 24, 1885; May 15, 1887; May 19, 1888.

- 371.
- J. NIGRA*
- , L. Black Walnut.

Sparingly in the woods and along the river. May 29, 1882; May 25, 1883; May 14, 1884; May 15, 1887.

219. *CARYA*, Nutt.

- 372.
- C. ALBA*
- , Nutt. Shagbark Hickory.

The Hickories are rather rare trees in our limits, but there are several specimens of this species in the woods. May 26, 1885; May 12, 1887.

- 373.
- C. SULCATA*
- , Nutt. Western Shagbark Hickory.

Occurs sparingly in the woods. May 21, 1884.

- 374.
- C. TOMENTOSA*
- , Nutt.

There are several specimens in the woods.

- 375.
- C. PORCINA*
- , Nutt. Pignut Hickory.

There is a specimen along 15th avenue, N. $\frac{1}{3}$, E. $2\frac{3}{4}$.

LXVII. *CUPULIFERÆ*. Oaks.220. *CORYLUS*, Tourn.

- 376.
- C. AMERICANA*
- , Walt. Hazelnut.

Occurs sparingly along the river.

221. OSTRIA, Micheli.

377. O. VIRGINICA, Willd. Iron-Wood.

There is a single specimen in the woods near Woodruff avenue. May 1, 1882; April 26, 1884; May 4, 1885; May 1, 1887; May 2, 1888.

222. CARPINUS, Linn.

378. C. CAROLINIANA, Walt. (*C. americana*, Mx.) Blue Beech.

The only specimen is in the southern part of the woods. N. 1 $\frac{3}{4}$, E. 1 $\frac{3}{8}$.

223. QUERCUS, Linn.

379. Q. ALBA, L. White Oak.

Rather common in the woods and near the river. May 5, 1883; April 29, 1889.

380. Q. MACROCARPA, Mx. Bur-Oak.

There are some large specimens in the woods and on the bank east of the island.

381. Q. PRINOIDES, Willd. (*Q. castanea*, Muhl.) Chestnut Oak.

There are two or three specimens on the campus, one of which is near the station building.

382. Q. RUBRA, L. Red Oak.

In the woods, where it attains a large size, some trees being over two feet in circumference four feet above the ground. May 16, 1885; May 11, 1888.

224. FAGUS, Tourn.

383. F. FERUGINEA, Ait. Beech.

This is very abundant in the woods. May 8, 1882; May 6, 1888.

LXVIII. SALICACEÆ. Willows.

225. SALIX, Tourn.

384. S. NIGRA, L. Marshall. Black Willow.

Common along the brook west of Neil avenue. April 15, 1886; April 11, 1887; April 8, 1888; March 28, 1889.

385. S. ALBA, L. White Willow.

Is said to grow near the river.

386. S. PETIOLARIS, Smith. Long-stalked Green Osier.

I found several specimens of this last summer in the northern portion of the island. April 23, 1885.

387. S. CORDATA, Muhl. Heart-leaved willow.

Along the brook and near the island.

There are probably many other species growing within our limits, and perhaps some hybrids, but I am unable to identify them with any degree of certainty at present.

226. *POPULUS*, Tourn.388. *P. TREMULOIDES*, Mx. Quaking Aspen.

Along the river east of the island. March 28, 1889.

389. *P. MONILIFERA*, Ait. Cottonwood.

Abundant near the lake, $1\frac{1}{2}$ S., 1 E. April 23, 1885; April 13, 1888; April 20, 1889.

390. *P. DILATATE*, Ait. Lombardy Poplar.

There are three or four trees on the campus which each spring send up a large number of shoots from the roots and would spread if permitted to do so.

391. *P. ALBA*, L. Silver-leaf Poplar. Abele.

There are several trees just south of our limits, one of which overhangs the fence, and occasionally a young plant is found on our ground.

LXIX. CERATOPHYLLACEÆ. Hornworts.

227. *CERATOPHYLLUM*, Linn.392. *C. DEMERSUM*, L. Hornwort.

Abundant in the lake.

MONOCOTYLEDONS.

LXX. HYDROCHARIDACEÆ. Frogbits.

228. *ELODEA*, Michx.393. *E. CANADENSIS*, Mx. (*A. anacharis canadensis*, Plan.) Ditch Moss.

Very abundant in the lagoon east of the island and north of the road, S. $1\frac{1}{2}$, W. 5. In bloom May 25, 1889.

LXXI. ORCHIDACEÆ. Orchids.

229. *ORCHIS*, Linn.394. *O. SPECTABILIS*, L. Showy Orchis.

Mr. W. S. Devol found a specimen in the woods in 1882, and it has never been found since. May 10, 1887; May 22, 1888. This is a very rare plant about Columbus. Ernest Evans found a specimen in Neil's run two years ago. I found one in the North Columbus run last year, and this spring found six or eight plants in the Worthington "big woods" near Noble's run.

230. *CYPRIPEDIUM*, Linn.395. *C. PUBESCENS*, Willd. Large Yellow Lady-slipper.

A single specimen was found by Prof. W. R. Lazenby in the woods during the summer of 1882. May 12, 1882; May 18, 1884. I know of no plants growing near the city at present.

LXXII. IRIDACEÆ. Iris Family.

231. SISYRINCHIUM, Linn.

396. *S. ANGUSTIFOLIUM*, Mill. (*S. bermudiana*, L., var. *mucronatum*, Gray.)

Grows sparingly along the river east of the island. June 4, 1882; June 3, 1884; June 5, 1888.

LXXIII. LILIACEÆ. Lilyworts.

232. SMILAX, Tourn.

397. *S. ROTUNDIFOLIA*, L. Green-brier.

Abundant along the river south of the island. June 7, 1884; May 30, 1887.

233. ALLIUM, Linn.

398. *A. CERNUUM*, Roth. Nodding Garlic.

A few specimens were found last summer, on the hillside east of the culvert. $\frac{1}{2}$ S. $2\frac{1}{2}$ E. $\frac{1}{2}$. July 19, 1882; June 1, 1884; June 6, 1888.

234. CAMASSIA, Lindl.

399. *C. FRASERI*, Torr. (*Scilla fraseri*, Gr.) Quamash. Wild Hyacinth.

In the woods, but very rare. I found three specimens this spring near the east fence. May 14, 1882; May 24, 1883; May 24, 1885; May 13, 1887; May 23, 1888.

235. POLYGONATUM, Tourn.

400. *P. BIFLORUM*, Ell. Solomon's Seal.

Sparingly along the river south of the brook. May 12, 1882; May 15, 1883; May 10, 1884; May 19, 1885; April 30, 1888.

401. *P. GIGANTEUM*, Dietrich. Larger Solomon's Seal.

Rare; in the woods northeast of the island and on the bank to the east.

236. ASPARAGUS, Tourn.

402. *A. OFFICINALIS*, L. Asparagus.

Escaped from cultivation and is now growing on the hillside east of Neil avenue and near the lake. May 26, 1884.

237. SMILACINA, Desf.

403. *S. RACEMOSA*, Desf. False Solomon's Seal.

Along the river bank and north of the island spring. May 30, 1882; May 13, 1883; May 10, 1884; May 26, 1885; May 13, 1887.

238. ERYTHRONIUM, Linn.

404. *E. AMERICANUM*, Ker. Yellow Adder-tongue.

Common along the river and in the woods. April 11, 1882; April 14, 1883; April 17, 1884; April 26, 1885; April 16, 1886; April 10, 1887; April 18, 1888; April 10, 1889.

405. *E. ALBIDUM*, Nutt. White Dog-tooth Violet.

Common along the river south of the road. April 11, 1882; April 27, 1883; April 16, 1884; April 28, 1885; April 15, 1887; April 14, 1888; April 11, 1889.

239. *TRILLIUM*, Linn.406. *T. SESSILE*, L.

Very abundant in the woods and along the river. April 9, 1882; April 25, 1883; April 16, 1884; April 27, 1885; April 17, 1886; April 13, 1887; April 13, 1889.

407. *T. GRANDIFLORUM*, Salisb. White Trillium.

I found a single specimen in the woods this spring. Mr. W. J. Green found one May 5, 1882, near the river. May 1, 1882; May 5, 1883; May 7, 1884; April 21, 1886; April 17, 1887; May 5, 1888; April 20, 1889.

408. *T. ERECTUM*, L. var. *DECLINATUM*, Gray. Purple Trillium.

I found several specimens near the middle of the woods in a damp place April 24, 1889. There is much variation in color, some being a pure white and others a deep purple. May 14, 1882; May 7, 1884; May 5, 1888.

LXXIV. PONTEDERIACEÆ. Pickerel-weed Family.

240. *HETERANTHERA*, Ruiz. & Pav.*409. *H. GRAMINEA*, Vahl. (*S. chollera graminifolia*, Willd.) Water Star-grass.

This plant grows under nearly the same conditions as *Ranunculus aquatilis*, L., but is not so deeply submerged, some of the leaves floating at the surface. Its appearance is similar to the above, the pale yellow flowers rising above the water. It is curious that these two plants which resemble one another in many respects do not grow in the same locality, this one being found in a small pond just north of the road, where it is quite abundant. S. 1½, W. 5. The water is deeper, flows more rapidly, and the bottom is not so muddy as in the swamp where the *Ranunculus* grows. July 31, 1889.

LXXV. JUNCACEÆ. Rushes.

241. *JUNCUS*, Tourn.410. *J. EFFUSUS*, L. Bulrush.

Rather common in bogs, especially north of the island where there are two forms—one in which the flowers are borne near the top of the stem, and the other with them four or five inches from the top.

411. *J. TENUIS*, L.

Very common in dry grounds and along paths.

I have several unidentified members of this genus, collected in the large swamp north of the island.

LXXVI. TYPHACEÆ. Typhads.

242. *TYPHA*, Tourn.412. *T. LATIFOLIA*, L. Cat-tail.

Common in the island swamps. June 10, 1884; June 19, 1887.

243. SPARGANIUM, Tourn.

413. S. EURYCARPUM, Englm. Bur-reed.

Frequent in the swamp north of the island. June 1, 1885; May 15, 1887.

LXXVII. ARACEÆ. Aroids.

244. ARISÆMA, Martius.

414. A. ^rTRIPHYLLUM, Torr. Indian Turnip.

Common in the eastern part of the woods. May 8, 1883; May 6, 1884; May 16, 1885; April 21, 1886; April 30, 1887; May 6, 1888; April 25, 1889.

415. A. DRACONTIUM, Schott. Green Dragon.

In the southeast part of the woods; a few specimens have been found on the island, but it is a rare plant. N. 1½, E. 3½. May 24, 1887.

245. SYMPLOCARPUS, Salisb.

416. S. FŒTIDUS, Salisb. Skunk Cabbage.

There are five plants growing in a small bog back of the larger dormitory; S. 3½, W. 5½. It has not been found elsewhere, and does not seem to spread. March 12, 1882; May 5, 1883; April 29, 1885; April 19, 1886; April 23, 1887; May 8, 1888; March 17, 1889. It grows abundantly in a swamp southwest of Sellsville.

246. ACORUS, Linn.

417. A. CALAMUS, L. Sweet-flag.

There are a few specimens growing near the iron spring, but nowhere else. S. 2½, E. 2½. This is a rare plant in the vicinity of Columbus.

247. SPIRODELA, Linn.

418. S. POLYRRHIZA, Schleid. (*Lemna polyrrhiza*, L.)

Very abundant in the ponds around the island, completely covering the water with its green fronds.

LXXVIII. LEMNACEÆ. Duckmeats.

248. LEMNA, Linn.

419. L. MINOR, L. Duckweed.

Occurs sparingly with the above in the old river bed.

LXXIX. ALISMACEÆ. Water Plantains.

249. ALISMA, Linn.

420. A. PLANTAGO, L. Water Plantain.

Common near the iron spring, and in wet places east of the island. August 9, 1882; July 29, 1887; July 1, 1888.

250. SAGITTARIA, Linn.

421. S. VARIABILIS, Englm. Arrow-head.

The following varieties are found in the ponds east of the island. July 19, 1882; June 16, 1887:

422. *S. VARIABILIS*, Englm. var. *obtusa*, Englm.

423. " " " var. *latifolia*.

424. " " " var. *diversifolia*.

425. " " " var. *gracilis*.

426. " " " var. *hastata*.

427. *S. HETEROPHYLLA*, Pursh.

Rare; found with the above species.

428. *S. HETEROPHYLLA*, Pursh. var. *ELLIPTICA*, Gr.

This is occasionally met with in these ponds, the leaves being usually submerged.

LXXX. NAIADACEÆ. Naiads.

251. POTAMOGETON, Tourn.

There are several species found here, growing in the same localities as the *Sagittaria*, but as they are not in fruit I am unable to identify them. And the same is true of several other aquatic plants.

LXXXI. CYPERACEÆ. Sedges.

252. CYPERUS, Tourn.

429. *C. DENTATUS*, Torr.

430. *C. ESCULENTUS*, L. (*C. phymatodes*, Muhl.) Galingale.

These two species usually occur together along the brook east of Neil avenue.

253. SCIRPUS, Tourn.

431. *S. PLANIFOLIUS*, Muhl. (?) Bullrush.

Abundant in the swamp north of the island.

432. *S. ATROVIRENS*, Muhl. Bullrush.

Rather common along the brook and around the island.

254. ERIOPHORUM, Linn.

433. *E. CYPERINUM*, L. (*Scirpus eriophorum*, Mx. var. *laxum*.)

Very rare. I found a large specimen in the island swamp south of the dike in the fall of 1888.

255. CAREX, Ruppius. Sedges.

The following species have been found this spring. I have had much trouble in identifying them as, owing to the shortness of the time in which the work had to be done there was no opportunity to send them to a specialist. They are a very small portion of the species that may be found in and about the island swamp, but because many were not in fruit, I was unable to identify them.

434. *C. VULPINOIDEA*, Mx.

435. *C. SPORGANOIDES*, Muhl.

436. *C. LAGOPODIODES*, Schk.
 437. *C. CRISTATA*, Schw.
 438. *C. CRINATA*, L.
 439. *C. GRANULARIS*, Muhl.
 440. *C. PLANTAGINEA*, Lam.
 441. *C. PENNSYVANICA*, Lam.
 Sparingly southwest of the woods along the fence. May 14, 1882; April 15, 1888.
 442. *C. TENTACULATA*, Muhl.
 443. *C. GRAYII*, Carey.
 Rich moist soil in the woods; not abundant.
 444. *C. LUPULINA*, Muhl.
 445. *C. CONJUNCTA*, Bott.

LXXXII. GRAMINEÆ. Grasses.

I have several specimens still awaiting identification, but they are much rarer than those mentioned below.

256. *PANICUM*, Linn.

446. *P. SANGUINALE*, L. Crab-grass. Finger-grass.
 Common south of the botanical building.
 447. *P. CAPILLARE*, L. Old-witch Grass.
 Very abundant on the island north of the central lagoon. N. 1 $\frac{3}{4}$, W. 4 $\frac{1}{4}$.
 448. *P. DICHOTOMUM*, L. Panic Grass.
 Also common on the island in the above locality.
 449. *P. CRUS GALLI*, L. Barn-yard Grass.
 Common on the island and in waste places generally.

257. *SETARIA*, Beauv.

450. *S. GLAUCA*, Beauv. Bottle Grass.
 Common in fields, growing in waste places, along fences, etc.
 451. *S. VIRIDIS*, Beauv. Wild Timothy.
 More common than the above with which it is frequently found. In cultivated grounds near the nursery, S. 2 $\frac{3}{4}$, E. 1 $\frac{3}{4}$.

258. *LEERSIA*, Swartz.

452. *L. ORIZOIDES*, Swartz. Cut Grass.
 Common in swampy places along the river and west of the lake.

259. *CHRYSOPOGON*, Trin.

453. *C. NUTANS*, Benth. (*Sorghum nutans*, Gray.)
 I found a clump of this last summer along the island north of the road, S. 1, W. 4 $\frac{1}{4}$.

260. ARISTIDA, Linn.

454. A. PURPURASCENS, Poir. Triple-awned Grass.
Sparingly on the campus east of the Experiment Station.

261. MUHLENBERGIA, Schreber.

455. M. DIFFUSA, Shreb. Nimble Will.
Not common; southwest of the woods and near the lake along the path west of horticultural hall.

262. PHLEUM, Linn.

456. P. PRATENSE, L. Timothy.
Very abundant everywhere in fields and pastures. June 11, 1887.

263. AGROSTIS, Linn.

457. A. ALBA, L., var. VULGARIS, Thurb. (*A. vulgaris*, With.) Red Top.
Very common in fields; grows very luxuriantly along the brook south of the botanical building.

264. AVENA, Tourn.

458. A. STRIATA, Mx. Oat Grass.
Rather common in shady places along the river.

265. ERAGROSTIS, Beauv.

459. E. MAJOR, Host. (*E. poaeoides*, var. *megastachya*, Gray.) Stinking Eragrostis.
Common in waste places and roadsides; some fine specimens were found last summer on the old tennis court. August 5, 1882; July 20, 1887.

266. DACTYLIS, Linn.

460. D. GLOMERATA, L. Orchard Grass.
Very abundant in fields and meadows. June 9, 1882; May 24, 1887.

267. POA, Linn.

461. P. COMPRESSA, L. Blue Grass.
Very abundant in meadows.
462. P. PRATENSIS, L. June Grass.
Very common in fields. May 30, 1882; May 24, 1887.

268. FESTUCA, Linn.

463. F. ELATIOR, L. Tall Fescue Grass.
Common in the grass-plot field west of President Scott's house.

268. BROMUS, Linn.

464. B. SECALINUS, L. Chess.
Common along the river and elsewhere.

269. LOLIUM, Linn.

465. L. PERENNE, L. Darnel.

Common in the field back of President Scott's, and occasionally on the campus.

270. AGROPYRUM, Gærtn.

466. A. REPENS, Beauv. (*Triticum repens*, L.) Couch Grass.

This vile weed is fortunately not common in our limits.

271. ELYMUS, Linn.

467. E. VIRGINICUS, L. Wild Rye.

Abundant in the rich alluvial soil near the river

272. ASPRELLA, Willd.

468. A. HYSTRIX, Willd. (*Elymus hystrix*, L.) Lyme Grass.

In moist shady places along the river bank; rare.

ARTICLE V.—FOURTH CONTRIBUTION TO A KNOWLEDGE
OF THE LIFE-HISTORY OF CERTAIN LITTLE-KNOWN
PLANT-LICE. (APHIDIDÆ.)*

BY CLARENCE M. WEED.

THE CHERRY PLANT-LOUSE. (*Myzus cerasi*, Linn.)

Observations upon this species began in May, 1888, when the lice were very abundant on the terminal leaves of cherry trees on the Station grounds. The great majority of these were apterous viviparous females. Early in June pupæ of the winged form appeared, developing in a short time into winged migrants that left the cherry, apparently going to some unknown plant. Early in July all had disappeared from the cherry leaves, none being found during several hours' search.

During September of the same season a winged form returned to cherry and gave birth to young which developed into egg-laying females. These deposited eggs during autumn on the cherry twigs, and eventually died.

In the spring of 1889 the lice were extraordinarily abundant on the same cherry trees. Early in June pupæ of the winged form began to be present, and about June 10th the winged migrants appeared. This form continued developing in great numbers for the next three weeks, leaving the cherry as before and disappearing.

The apterous form continued to be present for some time after the winged ones began to appear, being found on the trees in numbers June 17, though much less numerous than the pupæ of the winged form. It was still present June 25, but not nearly so abundant as a week before, and soon after disappeared.

During the latter part of July, all of August and the first three weeks of September no plant-lice of any kind were present on the cherry trees. But late in September a winged viviparous form returned to the trees, continuing to come throughout October, and giving birth to young which developed into oviparous females. The winged males again flew in, not developing from the return migrants as did the form just mentioned.

*For the preceding contributions of this series see *Psyche*, v. V., pp. 123-134, 208-210, and *Bulletin Ohio Agricultural Experiment Station*, second series, v. I, pp. 148-152.

DESCRIPTION.

APTEROUS VIVIPAROUS FEMALE. Parent of Spring Migrant. Plate III, Fig. 1, 1a.

Length of body..... 2.0 mm.
 " " antennæ..... 1.5 "

Shining black with more or less brownish tinge when highly magnified; joints I and II of antennæ, femora and tibiæ of anterior legs, basal two-thirds of femora and tibiæ of remaining legs, brown. Surface of body finely granulate. Antennæ three-fourths as long as body; joints of same proportionate length as in winged migrant (see figure.) No frontal tubercle on head. Cornicles long, cylindrical. Cauda well developed.

Described from specimens taken on cherry, June 17, 1889.

WINGED VIVIPAROUS FEMALE. Spring Migrant. Plate III, Fig. 2.

Length..... 1.5 mm.
 Wing expanse..... 6.0 "
 Cornicles..... 0.6 "

Black shining except more or less of proximal portion of femora and tibiæ which are brownish. Antennæ long, roughened with numerous sori; joint I short and thick, same length as II, but the latter is much narrower; IV nearly three-fourths as long as III; V about two-thirds length of IV; VI short, about equal to I and II; VII long, very little shorter than III. A well pronounced frontal tubercle on head between the eyes. Cornicles long and slender. Cauda well developed, about one-fourth as long as cornicles. Wing veins more or less brownish, in places inclined to fuscous.

Described from many living specimens taken on cherry, June 17, 1889.

WINGED VIVIPAROUS FEMALE. Return Migrant. Plate III, Fig. 3.

Length of body..... 2 mm.
 Wing expanse..... 7 "

Head, thorax, antennæ, except basal portion of third joint, coxæ, apical portion of femora and tibiæ, and tarsi, shining black; spots along each lateral margin of abdomen, transverse series of spots on cephalic portion of dorsum of abdomen, a large nearly square blotch just behind middle of same, sometimes extending to cauda, quadrilateral blotch on ventrum of abdomen just in front of cauda, and cornicles brownish-black; remaining portion of abdomen yellowish-green; basal portions of third joint of antennæ, femora and tibiæ, brown. Wings subhyaline, veins brown. Cornicles long, slightly swollen beyond middle, flanged at tip. Joint I of antennæ two-thirds longer than II; III long, about one-third longer than IV, and shorter than IV plus V; IV one-fourth shorter than V; VI quite short, one-half as long as V; VII very long and slender, four times as long as VI. Cauda long.

Described from many specimens taken on cherry among colonies of young oviparous females, October 24, 1889.

WINGED MALE. Plate III, Figs. 4, 4a.

Length of body..... 1.2 mm.
 " head to tip of wings..... 3.5 "
 " antennæ..... 1.6 "
 Wing expanse..... 7.0 "

Black except basal half of femora and sometimes of tibiæ, which are brown. Wings subhyaline, veins piceous, brown towards base. Cornicles very long, slender, sub-cylindrical. Antennæ long; joint III nearly one-third longer than IV, which is one-fourth

longer than V; VI short, half as long as V; VII. very long, slightly longer than III; III to VI roughened and having numerous sori. Cauda long.

In some specimens, apparently those most recently developed, the body is not entirely black, but has blotches of greenish-brown, especially on the abdomen.

Described from many specimens taken on cherry leaves, November, 1889.

OVIPAROUS FEMALE. Plate III, Fig. 5.

Length 1 mm. Globose. Blackish throughout, with parts of legs less deeply colored than rest of body. Antennæ nearly half as long as body; six-jointed; joints I and II of nearly equal length; III very long, longer than any others; IV longer than V; VI nearly equal to IV. Rostrum stout, reaching second pair of coxæ.

Described from many specimens on cherry twigs, autumn of 1888.

EGG. 0.8 mm. long. Of usual form and black in color. Deposited on the twigs, especially about the buds.

Described from many specimens.

THE WILLOW GROVE PLANT-LOUSE. (*Melanoxanthus salicti*, Harr.)

In the second of this series of contributions I have briefly indicated the literature of this species and described the sexes and winter eggs. I desire now to add descriptions of the viviparous forms, with figures of all stages, repeating for the sake of convenience the descriptions of the sexes already published.

This plant-louse is found upon the great variety of willow trees in the vicinity of Columbus and is an exceedingly abundant species. Besides willow I have found it occurring upon maple and poplar (*Populus*) in the vicinity of infested willow trees. Its occurrence upon these was probably accidental, but it was apparently breeding and developing just as well as on its usual food-plant, in one case numerous eggs being deposited about the maple buds.

DESCRIPTION.

WINGED VIVIPAROUS FEMALE. Plate IV, Fig. 1.

Length, head to tip of folded wings.....	6.0 mm.
" of body.....	3.0 "
" " antennæ.....	2.0 "
" " cornicles.....	.4 "
Wing expanse.....	10.0 "

Color bluish black, with slight glaucous bloom; proximal half of third joint of antennæ yellowish brown, apical half, together with remaining joints, black; coxæ a little lighter than body, femora and proximal two thirds of tibiæ orange-brown; rest of tibiæ, together with tarsi, black; wing veins brownish, principal ones becoming greenish toward base, with wing insertions dark green; cornicles orange-yellow; a faint indication of a light grayish marking on dorso-meson of abdomen. Antennæ hairy; joint I slightly longer and considerably larger than II; III long, nearly as long as IV plus V, the last two being sub-equal; VI and VII also sub-equal; VII being very slightly the longer, and the two to-

gether being about as long as V; joints III to V roughened as shown at Fig. 1, *b*, Plate IV, the latter having a slight but distinct process on its outer side near the extremity. Eyes with a tubercle on their caudo-lateral angle. Body and legs furnished with rather long brownish hairs. Cornicles short, pyriform, flanged at tip. Rostrum reaching posterior border of middle coxæ.

Described from numerous living and freshly mounted dead specimens taken on twigs of willow (*Salix*) October 10, 1889.

APTEROUS VIVIPAROUS FEMALE. Plate IV, Fig. 2.

Length of body.....	3.0 mm.
Width "	2.0 "
Length of antennæ.....	2.0 "
" cornicles .....	.4 "

Body ovate, flattened. Color bluish black, with a slight glaucous bloom; two basal joints of the antennæ slightly lighter than the head, third joint and proximal two-thirds of fourth reddish-brown, remaining portion of antennæ blackish; coxæ a little lighter than body, femora and proximal two-thirds of tibiæ, reddish-brown, remainder of tibiæ and all of tarsi, blackish; cornicles yellow. Antennæ hairy; joints III very long, nearly equal to IV plus V, the latter being sub-equal; VI and VII sub-equal, the two together being slightly longer than V. Body furnished with rather long brown hairs. Eyes with a tubercle on caudo-lateral angle. Prothorax with a lateral conical tubercle on each side. Cornicles pyriform, short, flanged at tip.

Described from several specimens taken on twigs of willow, October 10, 1889.

WINGED MALE. Plate IV, Fig. 4.

Length, tip of antennæ to tip of folded wings.....	7.5 mm.
" of body.....	2.5 "
" antennæ	1.7 "
Wing expanse.....	9.0 "

Body small; bluish-black, with glaucous bloom. Legs very long, hairy; coxæ unicolorous with body, femora and proximal $\frac{1}{2}$ - $\frac{2}{3}$ of tibiæ reddish-brown; apical portion of tibiæ, together with tarsi, black. Antennæ long, hairy, black throughout; joints I and II short, sub-equal; III long, $\frac{1}{2}$ longer than IV, which is also about $\frac{1}{2}$ longer than V; VII slightly longer than VI; joints III to VII roughened with numerous sensoria. Cornicles vasiform. Prothorax with a blunt tubercle on each side. Wings hyaline; veins brownish; wing insertions generally greenish-black.

Described from numerous specimens taken on twigs, *Salix*, Sp., October 29, 1888. Some of them seen *in copulo* with oviparous females.

OVI PAROUS FEMALE.

Length of body.....	3.0 mm.
Width of body across abdomen.....	1.5 "

Body bluish-black, with a glaucous bloom. Legs hairy; coxæ unicolorous with body; femora and proximal $\frac{1}{2}$ - $\frac{2}{3}$ of tibiæ yellowish-brown; apical portion of tibiæ, together with tarsi, black. Antennæ hairy; joints I and II unicolorous with body, proximal $\frac{2}{3}$ - $\frac{3}{4}$ of III yellowish-brown, and the remainder black: joints I and II short, sub-equal; III longest of any but shorter than IV+V; IV slightly longer than V; VI and VII sub-equal: V, VI and VII roughened with numerous sensoria. Prothorax with a blunt tubercle on each side. Cornicles short, vasiform, flanged at tip; orange-yellow. Rostrum blackish, reaching anterior margin of posterior coxæ.

Described from many specimens collected on twigs, *Salix*, Sp., October 29, 1888.

EGG. Plate IV, Figure 3. Length 1 mm. Oval, greenish at first, but becoming black in a short time. Deposited on bark of twigs, especially about the buds.

THE SPOTTED WILLOW PLANT-LOUSE. (*Melanoxanthus salicis*, Linn.)

The sexed forms of this species were found abundantly on willow during November, 1889, many of them pairing, and the females depositing eggs on the bark.

DESCRIPTION.

OVI PAROUS FEMALE. Plate V, Fig. 1.

Length of body.....	4.0 mm.
Width " "	2.0 "
Length of antennæ.....	2.0 "

Body flattened, ovate. General color bluish-black with a glaucous bloom; a distinct white line along dorso-meson the entire length of the body. A row of distinct white spots along each margin of the dorsum, and on the abdomen between these and the median line there is another row of smaller spots; at the base of the cornicles these spots frequently broaden into good sized patches, often extending to the median line; ventrum with transverse patches of white bloom between the segments; two basal joints of antennæ unicolorous with body, proximal half of third joint yellowish, remainder black; coxæ unicolorous with body, femora and proximal three-fourths of tibiæ honey-yellow; rest of tibiæ together with tarsi black; cornicles bright orange, often almost red, much more highly colored than legs. Body with antennæ and legs thickly clothed with rather long pubescence. Joints I and II of antennæ sub equal, III longest, about one-third longer than IV which is slightly longer than V; VI and VII sub-equal. Cornicles contracted at base, but much smaller in middle, and again contracting toward apex. Rostrum reaching third coxæ.

Described from many specimens ovipositing on willow, November, 1889.

WINGED MALE. Plate V, Fig. 2.

Length, tip of antennæ to tip of folded wings.....	5.00 mm.
" of body.....	2.0 "
" " antennæ.....	1.5 "
Wing expanse.....	8.0 "

Body with legs and antennæ very hairy. Color of body bluish-black; antennæ black, as are the legs, with the exception of more or less of proximal portion of femora and tibiæ, which are yellowish-brown; cornicles yellowish, much paler than those of the oviparous form. Prothorax with tubercle on each side. Antennæ roughened; joints I and II sub-equal; III longest, about one-third longer than V; VI and VII sub-equal, both together being about as long as V. Wings hyaline, veins yellowish-brown. Cornicles sub-cylindrical.

Described from several specimens, some of which were taken *in copulo* with oviparous females, on willow twigs, November 6, 1889.

EGG. Plate V, Fig. 3. Length 1 mm. Oval. When first deposited covered with a liquid which on drying becomes grayish, giving the egg a peculiar appearance, different from that of any other plant-louse egg with which I am acquainted. Under the microscope the structure of this grey coating suggests a thin covering of felt. The eggs are deposited in great numbers on the bark, numerous oviparous females congregating in one place for purposes of oviposition.

THE WHITE PINE PLANT-LOUSE. (*Lachnus strobi*, Fitch.)

This species was found in abundance on some of the white pine trees on the university grounds early in October, 1889. The only forms then present were the oviparous females and the winged males, together with a few young of both forms, the first named however, being by far the most numerous.

The oviparous females (Plate VI, Fig. 1, a.) were congregated upon the bark of the smaller branches, their heads being for the most part directed toward the trunk of the tree. When disturbed they moved about rapidly, usually attempting to conceal themselves on the other side of the branch. They also have a curious habit of waving their long hind legs in the air, probably for the purpose of frightening away enemies.

During the latter part of October and early in November the eggs were deposited in great number, on the leaves.

DESCRIPTION.

WINGED MALE. Plate VI, Fig. 2.

Length, head to tip of folded wings.....	4.5 mm.
" of body.....	2.0 "
Width "	0.9 "
Length of rostrum.....	1.6 "
" " antennæ.....	1.2 "
" " posterior legs.....	3.0 "
Wing expanse.....	6.5 "

Blackish with a slight glaucous bloom; a white longitudinal line on dorso-meson sometimes obsolete on head and thorax; cephalic and caudal margins of prothorax, sides of metathorax (except large spot below wing insertions), more or less of ventrum of abdomen, wing insertions, basal portion of femora and also in some specimens basal portion of third joint of antennæ, brownish. Body, together with legs and antennæ, thickly provided with rather long hairs. Joints I and II of antennæ short, sub-equal; III long—as long as IV plus V, which are sub-equal; VI short, two-thirds as long V, with prolongation thick and indistinct, terminating bluntly; joints III to V roughened with numerous sori. Wings sub-hyaline; veins dark brownish, stigma almost black; cubital vein indistinct, twice forked. Coxicles sub-obsolete. Rostrum very long, reaching nearly to cauda.

Described from several living and freshly killed specimens, some of them seen in copula with oviparous females.

OVI PAROUS FEMALE. Plate VI, Fig. 1.

Length of body.....	4.0 mm.
Width " "	1.5 "
Length " antennæ.....	1.4 "
" " posterior legs.....	4.2 "

Body shining black, more or less tinged with brown; a conspicuous white line beginning at head on dorso-meson and running caudad on thorax and also a short distance on abdomen, then disappearing, but reappearing near caudal extremity; two distinct

white sub-triangular patches on each side of dorsum of abdomen, one being caudad of cornicle and the other cephalad of it; ventrum of abdomen, especially cephalad covered with a whitish bloom; basal half of third joint of antennae, brown, as are also the femora, except at articulations, and basal portion of tibiae. Cornicles very short, conical, pitchy-black. Rostrum reaching nearly to middle of abdomen. Body, together with legs and antennae, furnished with numerous rather long brown hairs. Joints I and II of antennae, sub-equal; III longest, as long as IV plus V, the latter being sub-equal; VI shorter than V, with terminal portion thick and blunt; joints III to V not roughened.

Described from many living and freshly dead specimens taken on limbs *Pinus strobus*, October 16, 1889.

EGG.—Plate VI, Fig. 3. Length 1.2 mm. Elongate oval. Yellowish brown when first laid, but becoming black afterwards.

Described from many specimens on leaves *Pinus strobus*, October, 1889.

THE TOOTHED WILLOW PLANT-LOUSE. (*Lachnus dentatus*, Le Baron.)

This remarkable species was originally described by Dr. Le Baron in his second report as State Entomologist of Illinois (pp. 138-139), who states that it is "found in flocks in October and November on the under side of the branches of the gray willow". The winged form is figured, and both winged and apterous forms are described.

Nothing of importance has been added to our knowledge of the species since the publication of Dr. Le Baron's article; although Buckton* has surmised that it is identical with *Lachnus viminalis*, Fonsc; and Professor O. W. Oestlund,† apparently on the strength of Buckton's surmise, positively states that the two are the same, an assertion which has yet to be proven, and until this is done, our species should retain Le Baron's name.

I first found this insect during October, 1889, on twigs of various kinds of willow. Early in the month both apterous and winged viviparous forms were present, giving birth to young, which afterwards developed into what I supposed to be the sexed forms—winged males and oviparous females. The apterous viviparous females frequently occurred solitarily, but were more often found in colonies of the supposed sexual forms.

DESCRIPTION.

APTEROUS VIVIPAROUS FEMALE. Plate VII, Fig. 1.

Length.....	5.0 mm.
Width.....	2.5 "
Length of posterior legs.....	6.0 "

Body broadly ovate, covered with a dense fine pubescence. Color of body dark ashy gray, lighter posteriorly; antennae, legs (except basal two-thirds of femora and ring at base of tibiae which are reddish-brown), tubercular cornicles, tubercle on middle of abdomen,

* Monograph of British Aphides, vol. III, p. 67.

† Synopsis of the Aphididae of Minnesota, page 32.

rostrum and six transverse rows of six small circular spots on dorsum of abdomen, the two middle spots being but about half as large as those at the sides, black. On the dorsum of the abdomen, slightly back of the middle, and coinciding with the position of the two middle dots of the fourth row of spots is a prominent conicle tubercle. Cornicles reduced to flattened tubercles. Head large, sub-quadrate. Rostrum reaching first abdominal segment. Antennae short, a little more than twice as long as the head; joint III long.

Described from many specimens taken on willow. November, 1889.

WINGED MALE.

Length, head to tip of folded wings.....	9.0 mm
" of body.....	5.0 "
Wing expanse.....	16.0 "

Body black with a grayish pile, which on the abdomen gives it a distinct gray color; abdomen with transverse rows of black dots; cornicle black as is also the prominent conical tooth on middle of dorso-meson of abdomen; antennae piceous throughout, except in some cases in which the base of the third joint is brown; legs piceous, except proximal half of femora, and in some cases more or less of proximal portion of tibiae, which are reddish brown; rostrum black except at base where it is brownish, wing insertions and sides of mesothorax yellowish or reddish-brown; wings sub-hyaline, costal vein and stigma piceous, remaining veins brown. Antennae short, stout, provided with numerous spinose hairs, and ventral surface of joints III to VI tuberculate joint III long, equal to IV plus V; IV short, one-third shorter than V, which is slightly longer than VI, the latter being distinctly swollen in the middle.

Described from several specimens taken on bark of willow, November, 1889.

THE SCOTCH PINE PLANT-LOUSE. (*Lachnus pini*, L.)

This species occurred occasionally during the autumn of 1889 on Scotch pine trees on the university grounds. The only form seen was the oviparous female which was depositing eggs upon the leaflets.

DESCRIPTION.

OVIPAROUS FEMALE. Plate VII, Fig. 2.

Length.....	4 mm.
Width.....	2 "

Sides of head and thorax nearly straight, abdomen swollen. Body, together with legs and antennae, covered with rather long brown hairs. General color amber brown with a whitish bloom; dorsum dotted with numerous small blackish spots, and having often an indistinct dark longitudinal marking on each side of dorso-meson; eyes black; base of rostrum brown, extremity black; third and base of fourth joints of antennae pale brown, remaining apical joints black; femora, except tips, and basal half of tibiae, light brown, rest of legs black. Cornicles short, conicle, truncate. Rostrum reaching middle of abdomen. Joint III of antennae long, twice as long as IV; V one-third longer than IV, and VI a little more than half as long as V.

Described from many specimens taken on twigs of Scotch pine (*Pinus sylvestris*) November 12, 1889.

EGG. Length 1.8 mm. Black. Laid in rows along the inner surface of the leaf as shown at Fig. 3, Plate VII.

EXPLANATION OF PLATES.

The accompanying plates are photo-reproductions of drawings made from living or freshly killed specimens by my assistant, Miss Freda Detmers, under my supervision. A straight line at the right of an illustration indicates the natural size of the specimen figured.

C. M. W.

PLATE III. (Original.)

THE CHERRY PLANT-LOUSE. (*Myzus cerasi*, Linn.)

- Fig. 1. Apterous viviparous female. Parent of winged migrant. Enlarged.
- Fig. 1, *a*. Head and antenna of same. Enlarged.
- Fig. 2. Winged migrant. Enlarged.
- Fig. 3. Return migrant. Enlarged.
- Fig. 4. Winged male. Enlarged.
- Fig. 4, *a*. Head and antenna of same. Enlarged.
- Fig. 5. Oviparous female. Enlarged.

PLATE IV. (Original.)

THE WILLOW GROVE PLANT-LOUSE. (*Melanoxanthus salicis*, Harris.)

- Fig. 1, *a*. Winged viviparous female. Enlarged.
- Fig. 1, *b*. Head and antenna of same. Enlarged.
- Fig. 2. Apterous viviparous female. Enlarged.
- Fig. 3. Winter eggs on willow twig. Natural size.
- Fig. 4, *a*. Winged male. Enlarged.
- Fig. 4, *b*. Head and antenna of same. Enlarged.

PLATE V. (Original.)

THE SPOTTED WILLOW PLANT-LOUSE. (*Melanoxanthus salicis*, Linn.)

- Fig. 1, *a*. Oviparous female. Enlarged.
- Fig. 1, *b*. Head and antenna of same. Enlarged.
- Fig. 2, *a*. Winged male. Enlarged.
- Fig. 2, *b*. Head and antenna of same. Enlarged.
- Fig. 3, *a*. Egg. Enlarged.
- Fig. 3, *b*. Oviparous females and eggs on branch of Willow. Natural size.

PLATE VI. (Original.)

THE WHITE PINE PLANT-LOUSE. (*Lachnus strobi*, Fitch.)

- Fig. 1, *a*. Oviparous female. Enlarged.
Fig. 1, *b*. Head and antenna of same. Enlarged.
Fig. 2, *a*. Winged male. Enlarged.
Fig. 2, *b*. Head and antenna of same. Enlarged.
Fig. 3, *a*. Eggs on white pine leaflets. Natural size.
Fig. 3, *b*. Egg. Enlarged.

PLATE VII. (Original.)

- Fig. 1. The Toothed Willow Plant-louse. (*Lachnus dentatus*, Le Baron.)
a. Apterous viviparous female. Side view. Enlarged.
b. Dorsal view of same. Enlarged.
Fig. 2. The Scotch Pine Plant-louse. (*Lachnus pini*, Linn.)
a. Oviparous female. Enlarged.
b. Head and antenna of same. Enlarged.
Fig. 3. Eggs of *Lachnus pini*, on Scotch pine leaflet.



1a

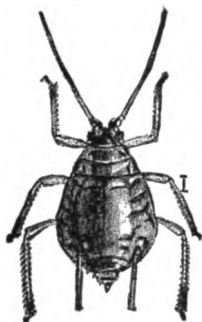


Fig. 1.

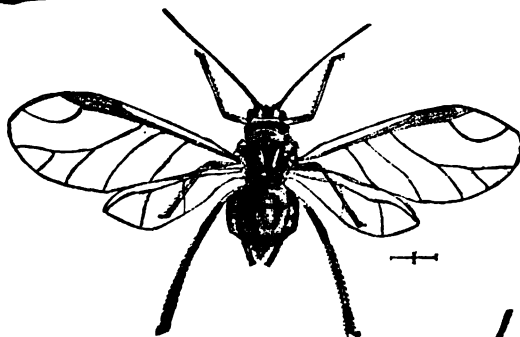


Fig. 2.

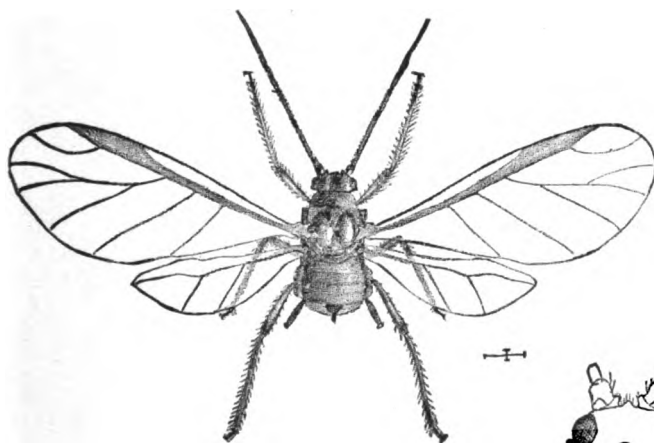
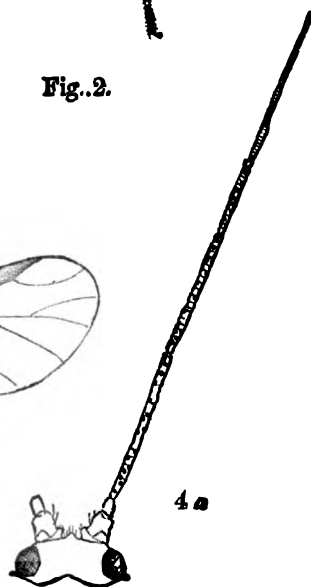


Fig. 4.



4a



Fig. 5.

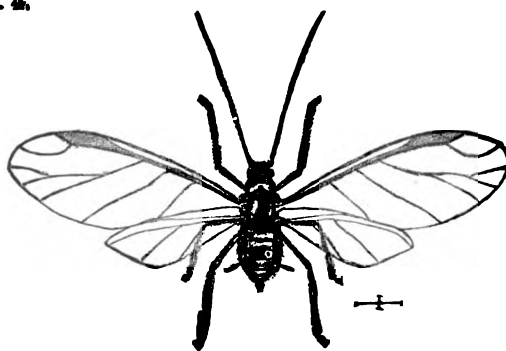


Fig. 3.

CHERRY PLANT-LOUSE

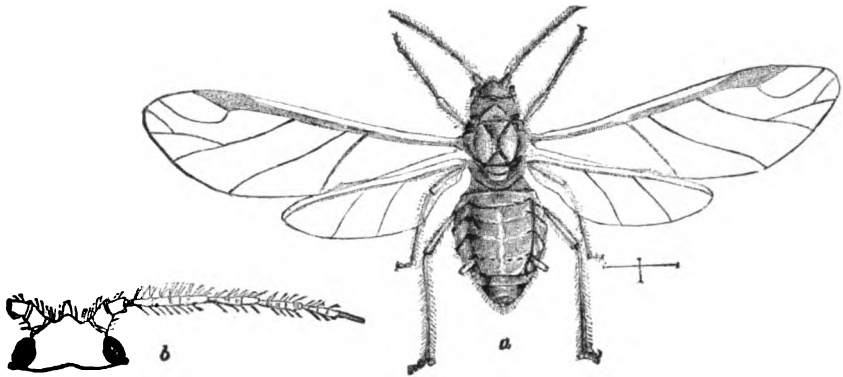


Fig. 1.

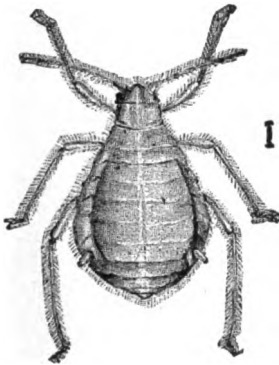


Fig. 2.

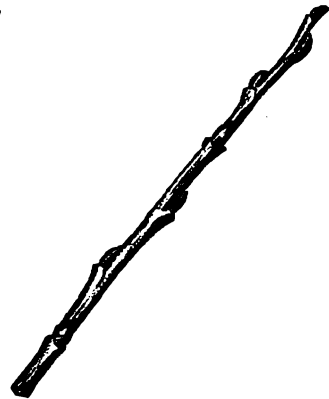


Fig. 3.

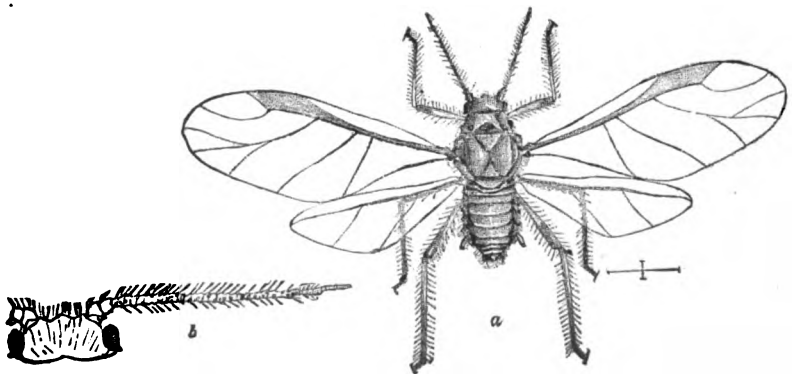


Fig. 4.

WILLOW GROVE PLANT-LOUSE.

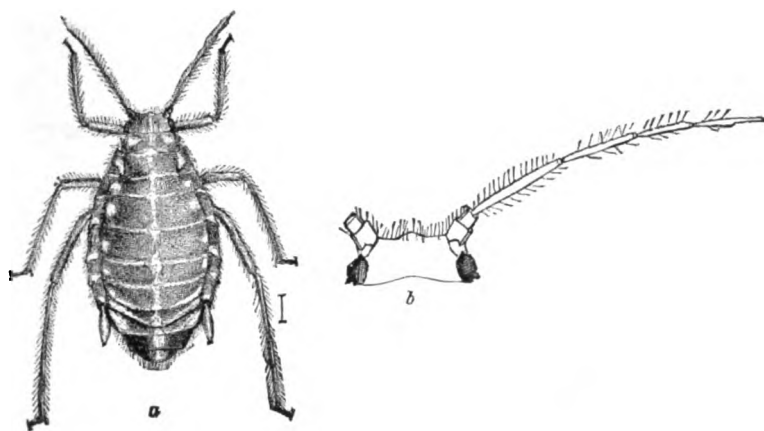


Fig. 1.



Fig. 2.



Fig. 3.

SPOTTED WILLOW PLANT-LOUSE.

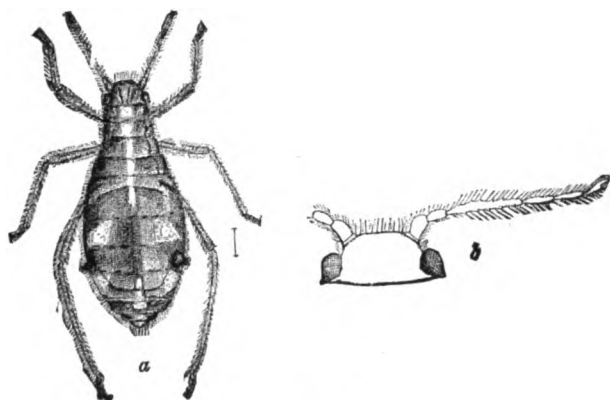


Fig. 1.

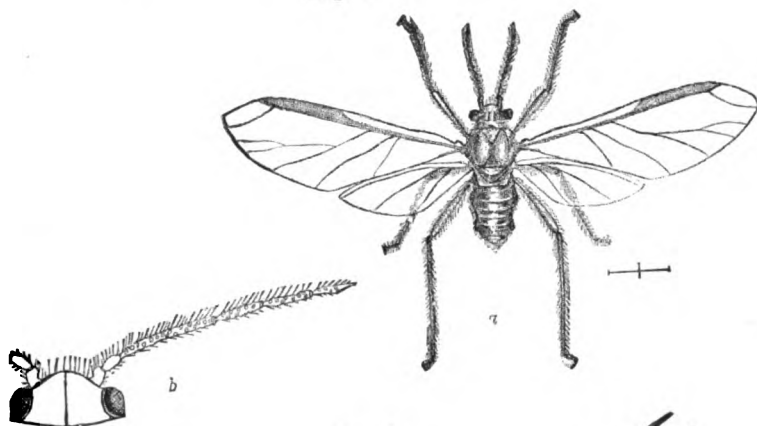


Fig. 2.

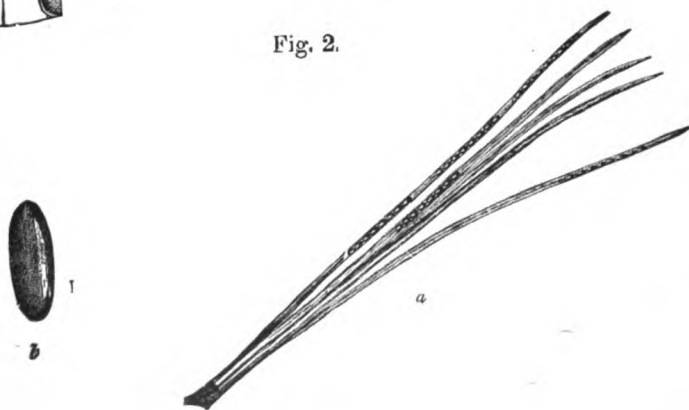


Fig. 3.

WHITE PINE PLANT-LOUSE.

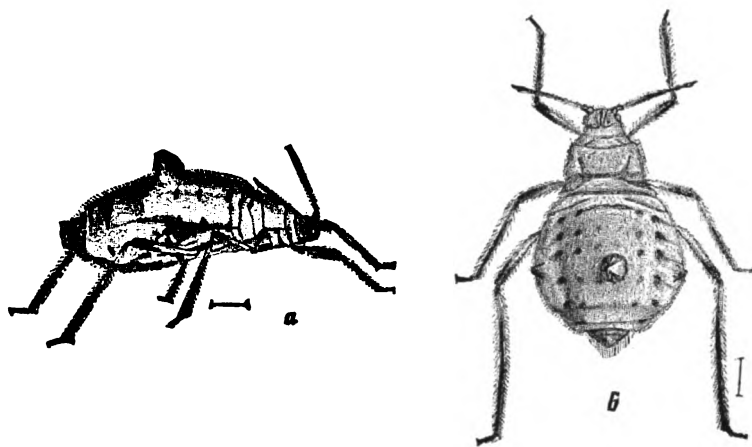


Fig. 1.

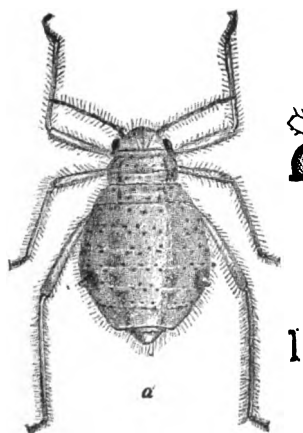


Fig. 2.

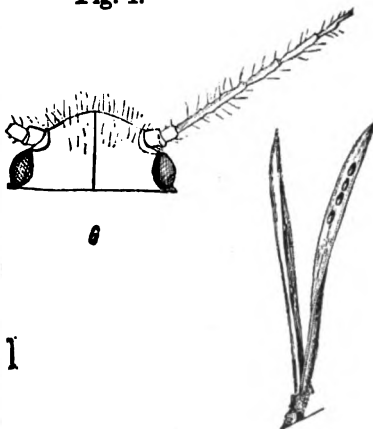


Fig. 3.

TOOTHED WILLOW PLANT-LOUSE

SCOTCH PINE PLANT-LOUSE.

ARTICLE VI.—A DESCRIPTIVE CATALOGUE OF THE SHELLS
OF FRANKLIN COUNTY, OHIO. PART I. LAND SHELLS.

BY H. A. SURFACE.

INTRODUCTION.

The collections upon which this paper is based have been made in connection with the work of the Division of Entomology and Botany of this Station; and the specimens have to a large extent been identified by comparison with the excellent cabinet of Mr. Henry Moores, of Columbus, to whom thanks are due for many favors extended. Free use has also been made of De Kay's Mollusca of New York, Hartman and Michener's little volume on the Shells of Chester county, Pennsylvania, Tryon's Structural and Systematic Conchology, and the monographs of Binney and Bland in the reports of the Smithsonian Institution.

Shells may be collected at almost any season of the year, but the best time is during the warmer months, especially after rains or while the ground is damp. They may then be found on and under logs, leaf-mould, stumps and the like. When the animal is present the best way to kill it is to drop the shell into boiling water, after which it is easily extracted. Dead or broken shells should not be taken when better ones can be obtained.

I desire to express my obligations to Mr. C. M. Weed, at whose suggestion the work was undertaken, and under whose directions it has been conducted; to Professor D. S. Kellicott who has granted the use of books and other privileges which have been of much help, and especially to my esteemed friend, Mr. Henry Moores, who has shown many favors.

OHIO AGRICULTURAL EXPERIMENT STATION, *May*, 1890.

DESCRIPTIVE CATALOGUE.

MOLLUSCA.

Animals of more or less unsymmetrical build and soft structure, without any skeleton, vertebral column, or articulated limbs. Generally furnished with a protecting calcareous shell secreted by the skin. Pulmonary circulation complete and distinct; blood white or bluish (in the genus *Planorbis* it is red). Animals breathing in air or water; oviparous and viviparous; carnivorous and herbivorous; living on land, or in fresh or salt water.

Two classes of mollusca are to be considered in this catalogue. They are as follows:

- Animal with head and foot distinct. Shell when present more or less spiral GASTEROPODA.
Animal with head and foot united. Body bilaterally symmetrical, and usually covered by a bivalve shell.....CEPHALOPODA.

CLASS GASTEROPODA.

Animal with head and foot distinct; usually furnished with eyes in the tip or near the base of the superior pair of tentacles; body mostly clothed by the mantle within the protecting spiral or conical univalve shell; beneath with a thickened expanded, elongated disk or foot. In the shell bearing species the posterior part of the body is within the shell, while the anterior part and foot are extended when in locomotion, being doubled upon one another and retracted into the shell when the animal is disturbed.

Two orders of this class are found here. They may be distinguished as follows:

- Shell (when present) spiral, inoperculated; animal terrestrial or subaquatic, respiring free air through an opening in or under the right side of the mantle. Sexes united in the same individual.....PULMONATA.
Shell spiral and operculated. Animals mostly marine or fluviatile, but sometimes terrestrial, breathing by means of pectiniform branchiae. Sexes separated, (in different individuals).....PECTINIBRANCHIATA.

ORDER PULMONATA.

This order includes all the land and fresh water Mollusks respiring free air. Respiration takes place through an opening in or under the right side of the mantle, and the respiratory organ is in the form of a closed chamber, lined with the pulmonic vessel. The animals of this order are nearly all terrestrial, but some are subaquatic and others even fluviatile. They are hermaphrodites, with reciprocal impregnation, and are generally oviparous. They are normal Gasteropoda, having a broad disk-like foot, and usually a large, spiral, inoperculate shell.

The animals of this order are universally distributed, but are especially found in warm and humid regions, where they can find the moisture and vegetation so necessary to their existence. Islands especially favor their multiplication, while in arid countries they are found only during seasons of rain if at all.

We have noticed in making collections in different parts of Ohio that land snails are not nearly so common in sand-stone regions as in those of lime-stone formations—the reason probably being that in the former there was but little lime with which to form the shells.

Fossil shells of this order are found as far back in geological time as the Carboniferous period. This order is divided into three suborders which may easily be distinguished as follows:

Animal terrestrial.....	Geophila.
Animal inhabiting fresh water (fluviatile).....	Limnophila.
Animal inhabiting salt water (marine).....	Thalassophila.

SUBORDER GEOPHILA.

Animal terrestrial; tentacles two, retractile or contractile, cylindrical, shorter than the eye peduncles and placed under them, sometimes very small or obsolete. Eye-peduncles long, cylindrical, ending in bulbs which contain the eyes, retractile by invagination. Shell mostly present and spiral, always inoperculate in the adult.

Four families of this sub-order occur in our fauna, distinguishable as follows:

- Shell spiral, more or less globular or conical, varying in form, usually thicker and less transparent than in the Zonitidae, and with or without the reflected lip; aperture edentulous, or contracted by teeth. Foot without a distinct locomotive disk, simple posteriorly**HELICIDÆ.**
- Shell very small, multispiral, cylindrical, or oval-oblong; lip simple or reflected, its extremities joined by a callus.....**PUPADÆ.**
- Shell oblique-ovate, paucispiral, imperforate, very thin and fragile, pellucid, unicolored; aperture very large, obliquely oval; spire short; body whorl large; peristome simple, acute.....**SUCCINEIDÆ.**

Shell very thin and shining, (or in some genera internal and rudimentary), ours large, much depressed, orbicular, amber or chestnut color, with a thin simple lip and a large open umbilicus.....ARIONIDÆ.

Family HELICIDÆ.

Animal with the posterior portion of the body spiral and enclosed in the shell above the foot, or sometimes elongated. Eyes in the end of long, cylindrical, invaginate peduncles; tentacles shorter, retractile. Mantle thin, small, discal or spiral, in the middle of the back, lining the shell and extending to the edge of the aperture; pulmonary orifice in the collar or edge of the mantle on the right side near the angle of the mouth of the shell, anal opening near the latter; foot narrow, elongate without a distinct locomotive disk; orifice of reproductive organs usually below the respiratory orifice, or behind the right eye-peduncle. Shell variable in form—spiral, usually thicker than in *Zonitinae*, discoidal, sub-orbicular, turbinate, or trochiform, or even sometimes rudimentary.

The family *Helicidæ* contains the true snails. They are carnivorous and herbivorous, and are also oviparous and hermaphroditic, but require the union of two individuals for reciprocal fecundation. They deposit fifty or more white globular eggs in bunches in the damp earth in May or June and in about twenty days the young appear with a shell of about one and one-half whorls. These never form a reflected lip around the aperture of the shell until the animal (and shell) has attained its growth. In this way the young of most of the *Helices* may be distinguished from the mature, but are in this condition especially liable to be mistaken for *Hyalinae*.

Moisture is necessary for the existence of the animal, consequently they can only be successfully sought in damp places, under logs, leaves, etc.; the smaller species in particular are often found in pastures, lawns, gardens, etc. The species which have been introduced from Europe are mostly found around the abode of man.

They pass the winter (and also dry seasons) in a state of hibernation under logs and stones or deep in the light earth of their native localities, where they place themselves with the aperture upward and close the same with a clear transparent membrane or epiphragm, retreating further into the shell and forming more membranous partitions as the weather becomes colder or dryer.

The following genera of the family *Helicidæ* are found in this county :

Shell usually thick, never smooth and shining, of variable form, orbicular, convex, discoidal, globose or conic, generally rugose, striate, or ribbed; aperture transverse, oblique, oval or semilunar, with or without teeth; margins distinct; lip sometimes simple, or thickened internally, but mostly reflected.....HELIX.

- Shell moderate in size, rather thin, widely umbilicated; much depressed, striate or wrinkled, unicolored; the last whorl declining above toward the aperture.....MACROCYCLAS.
- Spire slightly elevated; shell exceedingly minute; umbilicated; aperture rounded; peristome thin, simple. Buccal plate (jaw) consisting of sixteen corneous laminae, partially over-lappingPUNCTUM
- Shell very small, planorbic; with revolving striae; aperture lamellarly toothed within the outer lip.....HELICODISCUS.
- Shell depressed or conical, generally umbilicate, more or less longitudinally but not spirally striate; thin, semi-transparent, smooth and shining, greenish or reddish horn-color; whorls 5 to 7, regularly increasing, the last not descending, generally anteriorly dilated; spire depressed, very rarely conic; peristome always thin, simple, acute.....HYALINA.

Genus HELIX.

The characters of the shell vary so greatly in this genus that no more precise diagnosis can be given than that in the family.

The shell varies from smooth to ribbed, or pilose, and from very minute to nearly two inches in diameter; also varies much in color, convexity and form.

The animal has an elongated, semi cylindrical, posteriorly tapering body; simple mantle, accurately fitting within the peristome of the shell; obtuse head; eyes at the end of long, cylindrical, invaginate, peduncles; and short retractile tentacles; generative orifice on the side of the head behind the right eye peduncle; respiratory orifice at the angle of the aperture of the shell in the collar, anal orifice immediately adjoining.

The twenty-three species of this genus found in this county may be readily identified by the following original artificial key:

Shell with reflected lip.

Perforate.

Dentate.*

Aperture lunate; shell large.....*H. thyroides*.

Aperture ear-shaped; shell small.....*H. leaii*.

Aperture lunate, somewhat closed by a long columellar tooth;

shell small, larger than the last.....*H. monodon*.

Aperture narrow lunate; shell minute.....*H. labyrinthica*.

Aperture tri-lobed.

Shell flat, spire very short; lip reflected as much at the upper extremity as at the other parts.....*H. tridentata*.

Shell elevated twice as high as the thickness of the lower whorl; edge of the lip turned directly forward at the upper extremity.....*H. fallax*.

Edentate (No tooth on the pillar lip).

Shell large, with spiral, rufous bands.....*H. profunda*.

Shell of medium size; unicolored.....*H. clausa*.

Shell very minute, about one-tenth of an inch in diameter.

Aperture oval; native.....*H. minuta*.

Aperture rounded; European.....*H. pulchella*.

* Dentate and edentate as used here have reference to the presence or absence of a tooth on the pillar lip only.

Imperforate.

Dentate.

- Shell large, conical, ventricose.....*H. exoleta*.
 Shell moderately large, depressed above; aperture tri-lobed;
 generally covered with papillae.....*H. palliata*.
 Shell small, somewhat depressed, aperture tri-lobed with a deep
 groove behind the lip.....*H. inflecta*.
 Shell small, with one long lamellar tooth, and a small notch
 in the peristome; covered with minute papillae or short hairs.....*H. hirsuta*.
 Shell small with one parietal tooth and peristome entire, not
 toothed.....*H. monodon*, var. *fraterna*.

Edentate.

- Shell very large; lip very broad and white.....*H. albolabris*.
 Shell medium, somewhat depressed, banded with many revolving
 lines.....*H. multilineata*.
 Shell medium, quite elevated, conical; whorls six; lip thickened
 internally.....*H. pennsylvanica*.
 Shell smaller, sub-globose; whorls 5; peristome not thickened;
 aperture uniformly rounded.....*H. mitchelliana*.

Lip simple, not reflected.

- Shell colored with wavy brown, interrupted bands, coarsely
 striate, depressed and somewhat angular.....*H. alternata*.
 Shell large, thick, rounded, with two (sometimes more or fewer)
 uninterrupted, revolving reddish-brown bands.....*H. solitaria*.
 Shell small, striate; umbilicus wide.
 With a single tooth within on the base of the outer whorl;
 whorls 6½.....*H. perspectiva*.
 With no tooth; whorls 4; diameter four millimetres.....*H. striatella*.

HELIX SOLITARIA, Say. Plate VIII, Fig. 1.

Height 15 mm.; width 22 by 25 mm. Shell very large, coarse, solid, sub-globose, broadly umbilicated; spire convex-conic, with crowded and oblique striae; from white to reddish-horn in color, with two or more revolving dark reddish or brownish bands; whorls five and one half or six, wrinkled across and convex; suture very distinctly impressed; aperture wide orbicular-lunate; somewhat pearly white and banded within; peristome simple, acute, not reflected, the edge toward the umbilicus slightly thickened, terminations united by a thin callus; umbilicus large, distinctly exhibiting all the volutions.

This species is said to derive its name from the fact that only a single specimen was sent to the describer. A variety is occasionally found with the sutures distinct and deeply indented, and very rarely a reversed shell is taken. The species ranges from dry ridges to moist river bottoms. It is rather common in this county, as well as throughout the State, but its area of distribution is somewhat limited as it is found mostly in the States north of the Ohio river. It also occurs in the Postpleiocene of the Mississippi valley. The shell varies somewhat in coloration and the number of revolving bands.

HELIX ALTERNATA, Say. Plate VIII, Figs. 2a, 2b, 2c.

Height 8-10 mm.; width 20 by 25 mm. Shell orbiculate-depressed, more or less convex above, obliquely and closely ribbed-striate. Whorls 5 or 6, flattened, quite roughened above the striae, smooth beneath; base of shell convex. Often angular at the periphery (between the upper and under surface), especially so in younger specimens. Aperture oblique, not enlarged; lip simple, thin, brittle, regularly curved, and glossy and pearly within; tooth wanting. Umbilicus very wide and deep, allowing all the convolutions to be seen within. Under surface not only much smoother but also much paler in color than upper. Epidermis dusky; shell light, but each whorl is quite freely crossed by many zig-zag bars of deep reddish brown, becoming larger and more distant toward the aperture; these rufous bands are interrupted by a light colored revolving band, especially visible on the basal surface. Head and tentacles of animal light slate; back brown, merging into brownish orange.

This species is very common in summer under wet logs, along streams and in other moist places, as well as under the bark of decaying trees. It must find a very secure retreat on which to hibernate as we have found but two or three live specimens the past winter, although several dozen dead shells have been taken.

A variety is sometimes found in this county with a very highly elevated spire, and quite a deep suture; while another, equally peculiar, sometimes occurs with the spire quite flattened, making the convolutions in nearly or quite the same plane, especially above, like the *Polygyra*. Mr. Moores has in his cabinet representatives of a variety *albans* taken in this county, which are a brownish white color, and without the wavy brown bands above mentioned.

HELIX PERSPECTIVA, Say. Plate VIII, Fig. 3.

Height 3 mm.; width 7.5 by 8 mm. Shell small, broadly and perspectively umbilicated plainly exhibiting within all the body whorls, orbicular, very much depressed, excavated below, thin, regularly and strongly ribbed; color, yellowish rufous or reddish horn; whorls six and a half, increasing gradually, transversely striate with raised parallel acute lines, forming strongly impressed furrows between them; aperture small, lunately sub-orbicular, deeply within furnished with a single sub-prominent tooth on the base of the shell; peristome simple, thin, acute, with the extremities widely separated.

This species inhabits woodlands, occurring commonly in clusters under old bark. It is found over the eastern portion of North America, and also in the Postpleiocene of the Mississippi Valley.

HELIX STRIATELLA, Anthony. Plate VIII, Fig. 4.

Height 3 mm.; width 5.5 by 6 mm. Shell small, umbilicated, depressed-convex, thin; color brownish or reddish-horn; whorls four, slightly convex, the last somewhat inflated below, strongly oblique-striate; umbilicus large, expanded, shallow; aperture sub-circular or transverse; peristome simple, acute, thin, brittle, the terminations approximating.

Common in moist places under decayed bark and leaves. A number were found this spring in the drift of the Olentangy river after the over-

flow. According to Mr. Moores the shell of this species is very thin, opaque until well cleaned, smaller than *perspectiva* and larger than *limatula*. It is a northern species found in British America and north of the central part of the United States.

HELIX LABYRINTHICA, Say. Plate VIII, Fig. 5.

Height 1.7 mm.; width 2.5 mm. Shell very small, umbilicated, turbinate; color varying from brownish-horn to reddish-brown; whorls six, heavily ribbed above, more smooth beneath; striae distinct, elevated, equidistant; spire somewhat obtuse; base flattened; suture distinct; peristome thickened, somewhat reflected, rounded; umbilicus narrow, small; umbilical region excavated; aperture slightly oblique, somewhat lunate, with three revolving, deeply entering parallel laminae on the parietal wall,—one at the base, and two less developed, near the base, farther within: there are short, deep-seated, internal, revolving, rib-like laminae on the outer whorl. These laminae or tooth-like ridges revolve within the shell parallel to the suture.

Occurs in moist places, under bark. This specimen is rare in this county and may soon become exterminated, as will many others, by the draining of swamps, clearing of woodlands, and similar improvements. It inhabits all of eastern North America and is found in the Post-pliocene formation of the Mississippi Valley.

HELIX HIRSUTA, Say. Plate VIII, Fig. 6.

Height 4 mm.; width 6 by 7 mm. Shell small, sub-globose; whorls fine, slightly rounded, covered with numerous *short, rigid hairs*, arranged in oblique lines; aperture quite narrow, nearly closed by a long, slightly curved, prominent, lamelliform tooth on the parietal wall, reaching from the middle of the base to the junction of the outer lip with the body whorl; peristome considerably depressed, reflected, narrow, with a deep groove just behind it greatly contracting the aperture; a small, narrow, deep fissure near the centre in the inner margin of the outer lip; base greatly convex. Color: Epidermis pale, brownish to chestnut. Animal dark above lighter beneath.

This snail is found under loose bark and rubbish in river bottoms and swamp prairies; and is very common in this county. Colorless specimens sometimes occur, also specimens with very few hairs or nearly smooth. In some localities it is much larger than in others. It is found from New England to Kansas and Virginia, and also in the Post-pliocene formation of the Mississippi Valley. This species most nearly resembles *H. stenotrema*, but it is smaller and has a larger notch which is not as near the center of the peristome; also in *H. hirsuta* the parietal does not extend as far over the aperture, and is more sinuous at its lower edge, forming in this species a compound curve.

HELIX MONODON, Rackett. Plate VIII, Fig. 7.

Height 6 mm.; width 10 by 11 mm. Shell sub-globose, sub-depressed above; imperforate or umbilicated; covered with a pale chestnut or reddish horn-colored epidermis with minute hairs; sometimes diaphanous; spire convex; whorls five and a half, gradually increasing in size and convexity from the apex to base, the last two being much more convex, and the basal

whorl becoming more gibbous toward the front of the aperture, which is semi-lunar in outline and is constricted by a groove passing around just behind the reflected portion of the peristome; umbilicus either deep, but not exhibiting all the volutions, or partially or entirely closed by the reflected lip, the outer edge of which does not project beyond the surface of the whorl; base rounded, much depressed in the umbilical region; aperture widely lunate, somewhat closed by a lamelliform tooth on the parietal wall; peristome acute, thickened with white callus within, reflected. By breaking the shell away a transverse internal tubercle or false pillar may be seen on the base.

Occurs under decayed bark and stones on hillsides, along fences and in woods. It is found in all eastern North America and in the Post-pliocene formation of the Mississippi valley. This shell varies much in size, coloring, form of the umbilicus and shape.

HELIX MONODON, Rackett, var. FRATERNA, Say.

Shell similar to *monodon* in general appearance, but differing from it in having the universally closed umbilicus; shell smaller and tooth less prominent.

Found on hillsides and river bottoms. Very common. Occasionally occurs with spire much elevated.

HELIX LEAH, Ward.

Shell somewhat similar to above, but much smaller, with a dark shining epidermis; a uniformly open umbilicus; much greater convexity; convolutions much narrower; and general habitat differing from either of the above. "This shell has often been considered a variety of *Helix monodon*, Rackett, but a thorough acquaintance with the shell and the habits of the animal will place it among true species. It is found on a peculiar locality, very different from that of *H. monodon*; it never appears to extend its range, and does not vary in color of shell or animal. It is the most consistent species as to general features of the shell and habits of the animal with which I am acquainted." FRANK HIGGINS.

Found in swamp prairies only. Once common about two miles south of Columbus, but now becoming rare.

HELIX PALLIATA, Say. Plate VIII, Figs. 8 and 9.

Height 10 mm.; width 20 mm. Shell depressed, with oblique, irregular, interrupted transverse, striae. Whorls five, somewhat flattened above and rounded beneath, with a sub-angular fold passing around the larger convolution giving the latter a semi-carinated appearance. Aperture tri-lobed, much contracted by the peristome and teeth; lip white, sometimes edged with a pinkish-brown or blue, widely reflected, with two projecting teeth on its inner margin—the upper one more acute and prominent, the basal one lamellar and less prominent; pillar with a long white curved tooth, originating in the umbonal region and forming one boundary of the aperture; peristome continuing over the umbilicus, completely covering it with a white callus. Epidermis dark, covered with numerous minute tubercles with scattering stiff hairs or setae. Color reddish-brown, or chestnut-color; lip whitish, occasionally tinged with pink or blue.

We have two or three varieties depending upon the presence or absence of papillæ, carina and color. It is a common shell in this county, being found mostly in river bottoms.

HELIX INFLECTA, Say.

Height 7 mm.; width 11 by 12 mm. Shell imperforate, sub-depressed; epidermis brownish horn-color, frequently with very fine hair-like projections; whorls five with quite delicate transverse striae; suture not much impressed; aperture tri-lobed, greatly contracted by a deep groove behind the reflected lip so that the outer edge of the latter is but level with the body whorl; peristome white, narrow, reflected, with two acute teeth with the points directed inward on the inner margin, the superior one more inflected than the inferior, the two separated by a circular sinus forming one of the three lobes of the aperture; parietal tooth, long, white, arcuate; umbilicus covered, its region considerably impressed.

Occurs in damp woods on hillsides and river bottoms, and is very common. It is found over all the territory between the Appalachian and Rocky mountains, also in the Post-pliocene formation of the Mississippi valley.

HELIX TRIDENTATA, Say. Plate VIII, Fig. 10.

Height 8 mm.; width 14 by 16 mm. Shell very much depressed orbicularly (from above), with spire but very slightly elevated; whorls five and one-half, slightly convex, and crossed by numerous, crowded, minute, elevated striae; aperture lunate-triangular, contracted by a groove behind the peristome, tri-lobed on the inner margin of the outer lip by three curves which form at their junction, two acute white teeth projecting on the inner edge; pillar lip with a strong, oblique, curved, white tooth in the aperture; peristome broadly reflected along its entire length; striae converging into the deep open umbilicus of which only a very slight portion is covered by the broad, reflected base of the peristome. Epidermis brownish-horn to chestnut-colored; animal bluish-slate, darker in front, on the back and tentacles.

This species is quite variable and occurs mostly in fields bordering woods, and especially in rocky places. Very common here. It is found through all eastern North America from Canada to Missouri and Florida. Nearly allied to *H. fallax*, but differs from it in the depressed spire, greater size, one-half of a whorl less, slighter groove behind the peristome, *uniform plane of reflection of the entire lip*, narrower upper outer tooth, and less extensive parietal tooth.

HELIX FALLAX, Say. Plate VIII, Fig. 11.

Height 7.5 mm.; width 11 by 13 mm. Shell umbilicated, depressed-globose, with rib-like striae; colored red or yellowish-horn; spire elevated, convex; whorls five to six rather convex, with elevated lines; the last whorl deflected anteriorly, constricted by a groove behind the lip; aperture tri-lobed, contracted by a large oblique, tongue-shaped tooth on the parietal wall; peristome reflected, white, thickened bidentate, the upper tooth not on the outermost edge, bending inward, the lower sub-basal, the two separated by a profound sinus.

Occurs in woods and on hillsides, under leaves and decayed logs. Very common. Occasionally found with a white epidermis. It is found from Canada to Texas and Florida. Similar in outline to *H. tridentata*, but is distinguished from it by its smaller size, elevated spire, contracted aperture, larger teeth, and stronger inflection of the upper outer tooth.

HELIX ALBOLABRIS, Say. Plate VIII, Fig. 12.

Height 16 mm.; width 25 by 30 mm. Shell large, orbicular, sub-conical toward the apex, somewhat convex below; whorls five to six, arched, with many oblique striae, which are crossed by very minute revolving striae—the latter most plainly visible behind the reflected peristome; suture distinctly impressed; aperture contracted by the white, widely reflected lip, the entire portion of which is flattened in the plane of the mouth, and which completely covers the umbilicus in mature specimens. In young specimens the umbilicus is open and the lip is less reflected. Spire somewhat elevated; color, a uniform yellowish-brown, russet, or light chestnut, sometimes with a pinkish hue. Animal light, from white to cream color or light brown.

This species varies much in size. It is the largest *Helix* found in Ohio, and is rare in Franklin county, although it seems to be quite common in many other localities; occurs mostly on dry ridges and in rocky places; sometimes (rarely) with a tooth on the parietal wall.

According to Dr. Gould these snails deposit their eggs in light mould near rocks and logs in the month of June. They vary from 30 to 80 in number and are white, opaque and elastic. The young come forth in about 20 days bearing a shell of one and one half whorls. In October they hibernate under logs, stones, etc., and turning the aperture upward they close it with a thin membrane or film of mucus, going further back into the shell and secreting more membranes as the weather becomes colder or dryer. Thus they remain during the winter months, and during some of the very dry summer seasons.

This species is more liable to be confounded with the *H. exoleta* Binney, than with any other shell found in this vicinity, but may be distinguished from it by (1) its width being greater in proportion to its height than that of the *H. exoleta*, (2) being generally without a tooth on the pillar, and (3) by the edge of peristome toward the body whorl at the upper end being broad and reflected in the same plane as the other portions of the white reflected lip in the *H. albolabris*, while in the *H. exoleta* the edge of the peristome turns forward near the body whorl, presenting a sharp edge at a right angle to the plane of the other portion of the lip.

HELIX MULTILINEATA, Say.

Height 14 mm.; width 20 by 23 mm. Shell moderately large, imperforate, rather thin, depressed sub-globose; spire convex; epidermish yellowish to dark-brown, with numerous dark red, finely undulated, revolving lines and bands varying in number from four or five to five times that many, sometimes confluent into bands; whorls five to six convex, with parallel, sub-equidistant striae separated by grooves; last whorl ventricose; aperture lunate, slightly contracted by the peristome, obtusely curved at the lower extremity instead of angulated; peristome white, reflected, not much expanded, rather thin, umbilicus entirely covered by a white callus, umbilical region indented. Animal granulated with large whitish granulae, interstices dark. Foot dark beneath.

It occurs in swamp prairies and river bottoms and is very common here. A light variety without bands, and one all rufous without bands

are found (rare). It is found from New York to Minnesota; in States bordering on the Ohio river. Varies in size and color. "This species congregates in vast numbers during the winter season under the sod, hummocks or under logs. A gallon and a half have been taken from one nest."—*F. Higgins.*

HELIX PENNSYLVANICA, Green. Plate VIII, Fig. 13.

Height 11 mm.; width 18 mm. Shell turbinate, sub-globose, moderately large, convex, elevated, imperforate, obliquely striate, some of the striae coarser uniting near the umbilical region; whorls six, well arched, and suture distinctly impressed; aperture oblique, sub-triangular, somewhat contracted by the peristome; lip white, narrowly reflected, not flattened, slightly thickened just above the base by an internal callus; umbilicus closed, but distinctly indented. Edentate. Color of epidermis, yellowish-horn to dark reddish-brown or russet.

Occurs under logs in woods and is rare. Peculiar to western Pennsylvania, Ohio, Illinois, Indiana, and Kentucky. This shell varies much in color; is sometimes brown, straw, pink or white, and occasionally bi-colored. According to Mr. Moores "*H. pennsylvanica* is smaller than *H. elevata*, and is distinguished by its medium size, absence of tooth, callus on inner side of lip near base, closed umbilicus, and aperture triangular."

HELIX CLAUSA, Say. Plate VIII, Fig. 14.

Height 10 mm.; width 16 by 18 mm. Shell conoidly sub-globose, not large, somewhat fragile, elevated, slightly perforated or sub-imperforate; whorls five somewhat convex, gradually increasing, the last slightly constricted behind the white, flat, reflected lip; striae obliquely crowded, rib-like, fine; color yellowish-horn to russet; spire sub-regularly conoid; umbilicus narrow, almost covered by the reflected peristome; aperture diagonal, sub-regularly lunate; peristome with a heavy white deposit, uniformly subangularly reflected, its columellar portion sub-dilated. Edentate.

The species is found in those states bordering on the Ohio river and west and south. It differs from *H. mitchelliana*, Lea in having the partially open umbilicus and deeper constriction behind the reflected lip; and it closely resembles some edentate forms of *H. thyroides*, but differs from the latter in size (being much smaller), and elevation (being comparatively more pointed). It occurs on hillsides and river bottoms; not as common here as *H. mitchelliana*. A variety (or sport) with the whirl reversed is met with here (rarely).

HELIX CLAUSA, Say, var. *MITCHELLIANA*, Lea. Plate VIII, Fig. 15.

Height 10 mm.; width 14 by 16 mm. Shell obtusely conical above, inflated below; with plainly visible oblique transverse striae, and very minute, wavy revolving striae, most easily seen just behind the reflected lip and near the sutures. Whorls five, moderately convex, and suture distinctly impressed. Lip white or bluish-white, reflected, with no tooth and *no callus*, curve almost regular, aperture gracefully rounded or fully lunate, slightly contracted by the lip. Edentate. Shell imperforate but with a slight impression

in the umbilical region. Color, corneous transparent to yellowish-horn; sometimes pink, the lip frequently bluish.

This shell is found in Kentucky and Ohio; but appears to be rare in other places, although we have taken a great many this winter. It resembles *H. pennsylvanica*, but is distinguished from it in being somewhat smaller, having finer striae; the lip forming a *regular* lunate curve, and having no thickening within; distinguished from *H. clausa* proper by being imperforate; and from *H. bucculenta* in being imperforate and edentate.

HELIX EXOLETA, Binney.

Height 17 mm.; width 23 by 28 mm. Shell convex, somewhat ventricose; whorls five to six, with fine parallel striae crossing obliquely; lip white, broadly reflected, covering the umbilicus; pillar lip with a prominent, oblique white tooth (sometimes absent); peristome reflected, white with a conspicuous white thickening near its base above the umbonal region; body-whorl very large and well arched; suture distinctly impressed; aperture rounded-lunate, somewhat contracted by the peristome, the upper end considerably in front of the basal portion causing the plane of the aperture to make quite an angle with the plane of the base. Epidermis uniformly colored a yellowish-horn or russet. Animal dark grayish brown to blackish above.

This species is found from western New York to Georgia and Missouri, also in the Post-pliocene formation of the Mississippi Valley. Most nearly resembling *H. albolabris*, but best distinguished from it by habitat, and by the animal being darker in color and longer, also by the tooth being generally present, and by the outer margin of the lip being more inclined forward *especially at its upper extremity*. The shell is also much smaller than that of *H. albolabris*. It is very common here; occurring on hillsides and in moist woodlands. Tooth often wanting, especially in thin shells. Shell sometimes white.

HELIX THYROIDES, Say. Plate VIII, Figs. 16-18.

Height from 12 to 14 mm.; width 20 by 25 mm. Shell rounded, convex: whorls five, convex, making the suture well impressed. Parallel curving striae crossing the whorls, and minute revolving striae visible behind the broadly reflected whitish lip which partly covers the umbilicus; aperture moderately large, but somewhat contracted, rounded-lunate, the plane of the aperture making quite an angle with the plane of the base of the shell; pillar lip in the adult with a prominent white, oblique, tooth; peristome white, thickened, greatly reflected, with its outer margin sometimes rolled forward so as to make it appear grooved on its face along the centre; umbilicus rarely closed, very small, about half covered, so that just one volution is visible. Epidermis of a uniform yellowish-brown or russet color; animal a soiled yellow.

This species occurs in woods, gardens, and among decayed wood; ranges from ridges to moist river bottoms. It is very common in this vicinity; varying much in habits, size and color. Sometimes found without the tooth, especially in thin or immature specimens.

HELIX PROFUNDA, Say. Plate VIII, Fig. 19.

Height 14 mm.; width 24 by 29 mm. Shell large, broadly umbilicated, orbicularly depressed, slightly convex toward the apex of the spire; whorls five to six, regularly rounded with deeply impressed oblique wrinkles or coarse striae; suture quite distinct; epidermis yellowish-horn color with reddish-brown revolving lines and bands, but sometimes uniformly brown, or albino; the larger rufous line on the body whorl is almost concealed upon the spire in the suture; lip white, reflected and flattened (except at the upper junction with the whorl), thickened, with a slightly projecting blunt tooth-like callus on the inner edge above the base; aperture obliquely circular, somewhat contracted by the peristome, flattened toward the plane of the base; umbilicus rather large, profound, exhibiting all the volutions to the apex; base convex, with the basal striae converging into the umbilicus. The lower margin of the lip is reflected over a portion of the umbonal cavity.

The species occurs under logs and stones on hillsides and along river bottoms; it is very common here. We have in the collection of the Station the following varieties:

- (a) with one broad and rufous band.
- (b) " many " " " bands.
- (c) " no " " " " being all white.
- (d) all rufous with no bands.

Found in the Post-pliocene formation of the Mississippi Valley.

HELIX MINUTA, Say. Plate VIII, Fig. 20.

Height 1.5 mm.; width 2.5 by 3 mm. Shell minute, widely umbilicated, depressed; slightly convex, white, opaque to transparent; whorls four, very minutely striated, the last larger and spreading broadly toward the apex; peristome thick, white, reflected, more nearly oval than circular; the ends approximate; aperture orbicularly dilated; umbilicus large, exhibiting all the volutions.

This snail is found among grass, under boards and rubbish; and occurs from Canada to Nebraska and Florida. It is very common. Until late years it has been considered identical with *H. pulchella*, Müller, of Europe, but Prof. Morse has shown that there is a difference. In his *Pulmonifera of Maine*, he says: "Our shell is more depressed; the whorls are smaller; the aperture is wider and less round; and the angle of aperture, is 27° (Fig. 1); while in *H. pulchella* it is 35° (Fig. 2). They also differ in the dentition of the lingual membrane; and the periostracha. Both species agree in presenting varieties which are strongly, and transversely, costate."

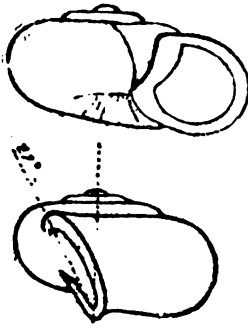


Fig. 1.

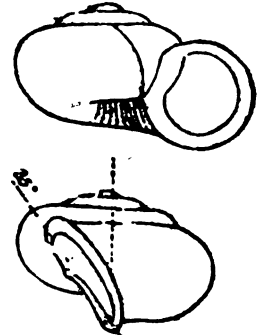


Fig. 2.

HELIX PULCHELLA, Müller.

Shell with the general characters of the last, excepting the differences given above.

This species has been introduced from Europe, and like most of the European Mollusca appears to thrive best in gardens and around the residences of mankind, while the American representatives are becoming exterminated by the influences of cultivation and civilization.

GENUS MACROCYCLIS.

Shell moderate in size, rather thin, widely umbilicated; whorls 4 or 5, depressed, almost planorbid, the last declining above toward the aperture, striate or wrinkled, unicolored; aperture oblique-ovate; peristome simple, slightly thickened or expanding; the extremities approaching, the lower one very slightly reflected. Shell somewhat similar to that of *Helix*, but more nearly planorbid. Carnivorous.

Only a single species of this genus has been taken in this county.

MACROCYCLIS CONCAVA, Say. Plate VIII, Figs. 21 and 22.

Height 7 mm.; width 16 by 21 mm. Shell convex-discoid, light corneous color, sometimes with a tinge of green; whorls 5, flattened above, rounded below, finely oblique-striate, the last one (the outer) somewhat enlarged toward the aperture, but flattened on the upper side; suture distinctly impressed; umbilicus very wide, funnel shaped, exhibiting all the volutions to the apex; whorls prominent, both above and below; aperture large, but short in the line of the perpendicular axis of the shell, being quite conspicuously flattened above; peristome thin, simple, sub-reflected at base, and its upper and lower edges connected by the thin callus or pearly deposit on the columella. Upper surface of animal grayish; eye peduncles long, slender, bluish.

Found from Canada to Georgia and Missouri, also in the Mississippi Valley Post-pliocene. Common. Under stones and logs, on dry ridges and river bottoms, and with *H. multilineata* and *H. Leai* in swamp prairies, where they collect together in choice stations in considerable numbers during the winter. The largest specimens are found in the heavy timbered river bottoms; those of the swamp prairies are much smaller.

GENUS HELICODISCUS.

Minute, planorbid or flat, whorls equally visible above and below, with distinct revolving striae and distant transverse striae; aperture lamellarly toothed within the outer lip; unicolored light. (Fig. 3.)



Fig. 3.

HELICODISCUS LINEATA, Say. Plate IX, Fig 1.

Height 1 mm.; width 3 by 3.5 mm. Shell small, very widely umbilicated or discoidal; epidermis pale greenish yellow; whorls four, planulate above, somewhat concave beneath, with numerous (about 15) equidistant, parallel, raised, revolving lines; suture distinctly im-

pressed; aperture remote from the axis, narrow-lunate, with from one to three pairs of minute, conical, white teeth within the outer lip; only the first pair is in sight, the others are deeper, sometimes visible through the shell; peristome simple, acute, thin; umbilicus wide, forming a concave depression of the base, within which each whorl is visible to the apex. Animal very light or translucent, flecked with light blotches. Body long and narrow anteriorly, very short posteriorly.

It is found in cool wet places under stones and leaves, and attached to rotten trees. Common in some localities, rare in others. It occurs in eastern and central North America.

GENUS HYALINA.

Animal similar to that of *Helix*. Shell depressed or conical, generally umbilicated, thin, shining, semi-transparent, greenish or reddish-horn color, more or less longitudinally but not spirally striated; whorls 5-7, increasing regularly; peristome simple, thin, brittle, acute; aperture roundly-lunate, not angled or depressed.

We have here nine species of this genus, which the following synopsis will aid in determining:

- Shell large (for this genus): 12 mm. ($\frac{1}{2}$ inch) in diameter.
- Shining, very smooth below.....*H. ligera*.
- Not shining, striate below and above.....*H. intertexta*.
- Shell small. Less than 8 mm. in diameter.
- Whorls crossed by 25 to 30 indenting lines, separated by smooth spaces.....*H. indentata*.
- Umbilicus closed; shell sub-conical; whorls 5 or 6.....*H. fukva*.
- Shell small, smooth, shining, very minutely striate; aperture large, transversely rounded; umbilicus small.....*H. arborea*.
- Shell with perceptible, fine oblique striae; aperture oblique; umbilicus large; diameter about 5 mm.....*H. limatula*.
- Shell minute, with microscopic wrinkles; umbilicus large; diameter about 2.5 mm.....*H. minuscula*.
- Shell thin, shining, uniform brownish; whorls 5; umbilicus broad; diameter 7.5 mm.....*H. nitida*.
- Shell small, depressed, thin and fragile, whorls 4, aperture enlarged; edge of peristome slightly thickened; umbilicus small.....*H. viridula*.

HYALINA NITIDA, Müller. (*H. hydrophila*, Ingalls.) Plate X, Fig 2.

Height 3.7 mm.; diameter 6 by 7.5 mm. Shell orbicularly depressed, moderately convex above and concave below; thin, shining, uniformly brownish-horn or amber color with delicate striae of growth; whorls four to five, very convex; suture well impressed; the outer whorl much larger than the others, somewhat smaller toward the aperture and slightly angular at the periphery; umbilicus deeply excavated, crateriform; whorls visible to the apex within the umbilicus; aperture oblique, lunate; peristome simple, thin, its basal margin arcuate or sub-angular.

This species occurs under logs and boards, near water, or in swamp prairies. It is very common in Franklin county. It has also been re-

ported from New York and British America. Some authors separate this species from *H. nitida*.

HYALINA ARBOREA, Say. Plate IX, Fig. 3.

Height 2.5 mm.; width 4.5 by 5 mm. Shell very small, much depressed, concave beneath, thin, fragile, smooth, shining, amber-colored; whorls 4 to 5, increasing regularly, with very minute, oblique striae; minutely and irregularly striated in the direction of the lines of growth; beneath smooth, with a moderate and deep umbilicus; aperture sub-lunate; peristome simple, thin, acute, and brittle, slightly flexuous. Animal with a dark head and back, lighter beneath and behind.

This snail is very common here, being found under decayed wood and rubbish. It occurs throughout all North America.

HYALINA VIRIDULA, Menke. Plate IX, Fig. 4.

Height 2 mm.; width 4.7 by 5 mm. Shell umbilicated, small, depressed, thin, pellucid, fragile, pale, brownish-horn or amber colored, wrinkled, shining; whorls four, the last increasing rapidly; aperture transversely rounded; peristome slightly flexuous, simple, its edge slightly thickened, not particularly acute, its outline nearly as a direct section of the whorl; lines of growth indistinct; umbilicus moderate, deep.

Under logs and loose bark. Common. Found in Europe and the United States. Resembles *indentata* above and *arborea* beneath; brighter than the latter and not quite as large.

HYALINA INDENTATA, Say. Plate IX, Fig. 5.

Height 2.5 mm.; width 4.5 mm by 5 mm. Shell small, sub-perforated, depressed, thin, highly polished, sub-iridescent, pellucid, very fragile; whorls four or a portion more, slightly convex, rapidly enlarging, with 28 to 30 regular radiating, sub-equidistant indented transverse lines, which extend to the indented centre of the imperforate base, with the intervening spaces very smooth; outer whorl expanding toward the aperture; suture distinctly impressed; aperture expanded, transverse; peristome simple, acute, very thin, its lower extremity extending to the centre of the base of the shell; umbilical region deeply indented but not perforated. Rarely the umbilicus is open. Animal dark-blue above, lighter behind and beneath.

Occurs under loose bark and logs in woodlands. Common. Shell sometimes pink. Found in the eastern and central portions of North America.

HYALINA LIMATULA, Ward.

Height 2.5 mm.; width 5 by 5.5 mm. Shell small, thin, somewhat depressed, broadly umbilicated; uniformly light-colored; suture distinct; whorls four, convex, delicately and obliquely striated; striae regular, parallel, less conspicuous below than above; peristome simple, acute, thin, its ends somewhat approximate; aperture rotund, oblique; umbilicus large, rounded, but not exhibiting all the volutions.

Found in moist woodlands and somewhat rare. Occurs from New York to Illinois.

HYALINA INTERTEXTA, Binney. Plate IX, Fig. 6.

Height 11 mm.; width 13.5 by 15 mm. Shell perforated, thin, moderately large, sub-conical, orbicular; epidermish yellowish-horn or chestnut-brown color externally, purplish within, with a light colored revolving line and an indistinct brownish band below it; whorls 6 to 7, sub-rotund, rather flattened, with numerous, equidistant, oblique, striae; these also impressed on the interior, and very minute spiral striae intersecting each other; suture impressed; apex elevated; aperture rounded, somewhat transverse; peristome simple, thin, acute, slightly thickened within by a pearly testaceous deposit, and its basal extremity slightly reflected at its junction with the shell so as to project slightly into the umbilicus, which is small and narrow but open to the apex, sometimes nearly obsolete; base whiter and smoother than the upper surface; sometimes strongly carinated at the periphery of the body whorl.

This species is found in dry woodlands and on hill-sides. It is becoming rare. It occurs in the States immediately west of the Appalachian Mountains.

HYALINA LIGERA, Say. Plate IX, Fig. 7.

Height 7 to 10 mm.; width 11 to 15 mm. Shell sub-globose or globose-conical, perforated; color yellowish-horn or brownish-yellow above, paler beneath; bright shining; whorls 6 to 7, finely and obliquely striate above, smooth below; suture not greatly impressed; aperture lunate, rounded, peristome thin, simple, acute; outer whorl thickened by a strong pearly, testaceous, deposit within its outer margin near the base and on the side of the whorl; perforation very small, umbilical region indented.

This is our largest *Hyalina*, but it varies much in size. Occurs in woods and on shaded hillsides. Mr. Moores says it has been common in this region but is now becoming rare. It is found from Georgia to the great lakes, and also in the Post-pliocene formation of the Mississippi Valley.

HYALINA MINUSCULA, Binney. Plate IX, Fig. 8.

Height 1 mm.; width 2 by 2.5 mm. Shell very small, depressed, convex; color whitish; whorls four, increasing slowly in diameter, with microscopic wrinkles; suture deep, very distinctly impressed; umbilicus large, but not spreading, deep, and exhibiting all the volutions; aperture rounded, nearly circular, spreading; lip simple, thin, acute; base rounded; columella with a thin callus.

This species is found in grass fields under sticks and stones; and is not very common in Franklin county. It occurs probably in all the eastern part of North America.

HYALINA FULVA, Draparnaud.

Height 3 mm.; width 3.5 by 4 mm. Shell minute, elevated, conic, thin, pellucid, very smooth and shining, minutely striated, amber-colored or smoky-horn; whorls 5 or 6, rounded, very narrow, smooth with a deep suture between; aperture semilunar, narrow, much higher and longer than broad; lip simple, acute; base convex; umbilical region indented, but umbilicus closed.

It is found under pieces of wood and among rotten leaves. This species most resembles *Helix labyrinthica*, but is distinguished from it by its polished surface and by the absence of parallel ridges within its mouth. It is common in the boreal region of the three continents, and in the United States to Texas and Florida.

GENUS PUNCTUM, Morse.

Shell exceedingly minute, discoid, umbilicate; aperture rounded; peristome thin, acute.—Hartman.

PUNCTUM MINUTISSIMA, Lea.

Height 1 mm.; width 1.5 mm. Shell very minute, umbilicated, depressed-turbinate or sub-globose; pale fuscous or reddish-horn color; shining, marked with transverse striae and microscopic revolving lines, both most conspicuous near the umbilicus; whorls four, convex gradually increasing; widely umbilicated; aperture obliquely sub-circular; peristome simple, acute, its columellar extremity sub-reflexed.

Occurs among fallen leaves in moist places. Rather rare here. Has been found in Maine, New York and Ohio. The buccal plate (jaw) consists of sixteen corneous laminae, partially overlapping.

Family PUPADÆ.

Shell generally minute, multispiral, cylindrical to ovate-conical, with a somewhat obtuse summit (pupiform); whorls several, the last contracted rather than expanded; aperture small, sub-circular or semi-oval, generally furnished with fold-like denticles, but sometimes simple; generally imperforate, sometimes rimate or sub-umbilicate, sometimes perforate; peristome slightly expanded, or sub-simple, margins equally distant, usually connected by a callus lamina. Animal twice as long as wide; broad and square in front; head separated from the foot beneath by a transverse groove; head transverse; tentacles four, the upper pair bearing the eyes (the front pair usually called *the* tentacles and the larger hinder pair the "eye-peduncles.")

Since these interesting little mollusks are very minute they generally elude observation unless one is seeking them closely. They mostly occur along the margins of streams in drift, under stones, and chips, but some are found in any woods under the bark of decaying logs, and stumps, while other species are found in grass fields, lawns, and in moss, where they may easily be found adhering to the under surfaces of boards and sticks. The knowledge of this fact enables the collector to procure them in abundance by placing boards for them on the grass over night. Many other small snails and slugs may be taken in this way.

Like most of our mollusks they are herbivorous, feeding principally on decaying vegetable matter. They pass the winter buried in the ground, or beneath decayed leaves, logs and other rubbish.

The following genera of Pupadæ are represented here:

Shell oblong-acuminate, quite shining, smooth and thin; whorls 5 to 7, rounded; aperture oval; columella short; peristome simple. CIONELLA.

Shell usually very small, deeply rimate, ovate; apex obtuse; aperture semi-oval, with four to seven folds; peristome but slightly expanded. VERTIGO.

Shell very small, cylindrical or oval-oblong; umbilicus slight; columella plicate or subdentate; lip simple or reflected, usually plicate or dentate within, extremities joined by callus; brown or horn color PUPA.

GENUS CIONELLA, Jeffreys.

Shell oblong-acuminate or ovate-oblong, striated or smooth, shining; whorls five to seven, rounded; aperture oval, about one-third the length of the shell; columella short, scarcely truncated, arcuate; peristome simple, thickened within.

CIONELLA SUBCYLINDRICA, Linn.

Height 5 mm.; width 2 mm. Shell small, ovate-oblong imperforate, smooth, thin, quite shining; color pale brown to smoky horn; whorls five to six, rather convex, the diameter of the last equaling two-fifths the length of the shell; apex somewhat obtuse, suture rather impressed; aperture oval, lateral, its plane nearly parallel with the axis of the shell; peristome simple, with the margin thickened, and often rufous, the margins joined by a callus; columella more or less obsoletely truncated at base. Animal short and stout, with a pointed tail, short tentacles, and long stout eye peduncles.

Under the bark of decayed timber and under moist decayed leaves in forests. Found in New England and in the States bordering on the Great Lakes and north. Not found farther south than the Ohio river. A species formerly supposed to be identical is found in Europe as far south as Spain and Italy. The distinction is proven by Prof. E. S. Morse. It is probably extinct here; was formerly found near Hayden's Falls, nine miles northwest of Columbus.

GENUS PUPA, Lam.

Shell usually very small, cylindrical or oval-oblong; umbilicus slight, a mere split, or rimate; plicate, striate, or costellate; brown or horn color; columella plicate or subdentate; lip simple or reflected, usually plicate or dentate within, the extremities usually joined by a raised callus. Animal with a short foot, pointed behind; lower tentacles short.

PUPA ARMIFERA, Say. Plate IX, Fig. 9.

Height 4 mm.; width 2.5 mm. Shell oblong-oval or cylindrically sub-fusiform, smooth; whorls six to seven, convex, the three near the aperture of about the same diameter, the

upper diminishing regularly, forming an obtuse apex; suture distinctly impressed; peristome white, thin, reflexed, almost completing the circle of the aperture; its two extremities connected by a thin testaceous callus; aperture nearly circular, deep, cup-form, with four or more teeth almost filling the narrowed throat, white within; one tooth on the body whorl commences at the superior margin of the aperture, large, prominent, and lamelliform, sometimes bifid; another more massive tooth is deeper in the throat near the base; two others project backward and inward from the inner edge of the aperture; umbilicus a little expanded and slightly perforate.

This species occurs east of the Rocky Mountains. It is found among grass and under chips and stones, in moist places. Mr. H. Moores says it is our largest and most common Pupa.

PUPA PENTADON, Say. Plate IX, Fig. 10.

Height 2 mm.; width 1 mm. Shell elongate-ovate, sub-perforated, minutely striated; whitish horn in color; whorls five, quite rounded and separated by a distinct suture; apex sub-acute; aperture oblique, almost semi-circular; teeth five or more, arranged around the aperture within; peristome sharp and somewhat expanded but not reflected; a ridge of white callus within the margin bears the denticles of which a very prominent one is on the parietal wall, two on the columellar portion of the peristome, and always two and sometimes as many as five others (smaller) on the inner side of the outer portion; the one on the parietal wall near the middle is largest; the one on the upper part of the columella next in size and the one on the base of the aperture opposite the first is third in size.

It is found among grass and under boards, and at the foot of trees; it is rather common, especially in moist places. This species occurs throughout the eastern half of the United States.

PUPA DECORA, Gould. Plate IX, Fig. 11.

Height 2.5 mm.; width 1.5 mm. Shell perforate, minute, ovately cylindrical, rounded at the apex, thin, shining, translucent; of a wine-yellow or amber color; regularly striated by lines of growth; spire of five or six closely revolving, rounded whorls, deeply separated at the sutures; aperture small nearly oval-rounded, provided with four teeth, the largest on the parietal wall, one on the peristome near the columella and two on its outer portion, all arranged so as to form a cross; peristome slightly reflected, rising against a distinct umbilical perforation.

The species is found among grass in company with the next, and is rather rare here. It occurs north of the middle of North America. Said by some to belong to the genus *Vertigo*.

PUPA FALLAX, Say. Plate IX, Fig. 12.

Height 5 mm.; width 2.5 mm. Shell conical, acute; whorls six, quite convex, regularly decreasing in size from the body whorl to the apex, the last one-third wider than the preceding and more than half the entire length; suture distinctly impressed; aperture lateral, rounded-oval; the margin white, sub-revolute, but not flattened, lined within by a white callus, its outer (upper) termination strongly curved toward the axis; umbilicus but slightly perforated.

It is found throughout the United States east of the Rocky Mountains. It occurs under bark and stones in damp or rocky places. It

has been common here in some localities but like many other species it is becoming rare, principally because its favorite localities are being destroyed.

PUPA CONTRACTA, Say. Plate IX, Fig. 13.

Height 2.5 mm.; width 1 mm. Shell cylindro-conic, whitish to light-horn color; whorls five to six, very convex, diminishing regularly from the ventricose base to the apex; suture distinctly impressed; peristome thickened, sub-reflected, white, its extremities united by a raised testaceous callus, making the margin of the aperture entire; aperture lateral, triangular, funnel-shaped, more than half as wide as the body whorl, with four teeth—one very large, coarse and irregular on the columella projecting into and very much filling up the aperture and having a concavity on the side toward the peristome; a small tuberculous tooth near the margin of the outer lip, and two rather larger deep in the narrow throat, one being in the base behind the columellar tooth and the other on the side of the umbilicus and apparently produced by the umbilical fold; base of shell keeled; last whorl contracted behind the peristome; umbilicus with a minute perforation.

The species inhabits all of eastern North America. It is found with *P. armifera* in moist places. Common.

PUPA RUPICOLA, Say.

Height 2.5 mm.; width 1 mm. Shell cylindrical, elongated; epidermis brownish-horn color; whorls six, well rounded, the three lower ones of nearly equal diameter, the three upper ones diminishing gradually and forming a slightly obtuse apex; suture well impressed; peristome widely reflected, thickened within, of a light brownish color; aperture lateral, semi-circular, slightly laterally compressed, limited above by the body whorl; teeth five, one prominent on the columella at its middle, compressed, centrally emarginate, and often bicuspid; another at the termination of the axis, marking internally the situation of the umbilicus, conical and often composed of two or more tubercles; a third in the base of the aperture, a fourth upon the peristome, and a fifth, often massive and prominent, deep in the fauces behind the one on the columella; umbilicus very small.

Found in moist places; rare. It occurs from Key West to Arkansas and New England.

GENUS VERTIGO, Mueller.

Shell deeply rimate, ovate; apex obtuse; whorls five to six, rounded; aperture semi-oval, with four to seven folds; peristome scarcely expanded; lip white. Animal with lappets on each side of the head; inferior tentacles wanting.

VERTIGO OVATA, Say. Plate IX, Fig. 14.

Height 2.5 mm.; width 1.5 mm. Shell minute, ovate-conic, ventricose, dark amber colored; whorls five, quite convex, the last much inflated, upper ones sub-acute; diminishing rather rapidly to the somewhat acute apex, with an indentation in the outer whorl toward the aperture; suture deep; peristome thin, somewhat expanded, forming two segments of circles, with a groove behind, and a thickening within; aperture semi-circular in general outline; teeth generally six, two on the transverse margin, two on the columellar margin, the upper of which is rather massive and the lower pointed, and two sharp and prominent on the margin of the peristome in the base and at the junction of the two curves; umbilicus expanded.

This species is found in lawns and pastures and among dead leaves. It is quite rare; and occurs from Maine to Texas.

Family SUCCINEIDÆ.

Shell oblique-ovate, paucispiral, imperforate, very thin, fragile, pellucid, unicolored; aperture large, obliquely oval, or ovate; spire very small; body whorl large, inflated; peristome simple, acute. Animal similar to that of *Helix*; tentacles short, conoid.

According to Hartman and Michener, "These animals mostly affect low grounds, along the margin of streams, or where it is subject to overflow; while others are found only on high ground, remote from water. When supplied with abundant food, and moisture, they seem almost too large to enter fully into their shells; when these fail them, and on the approach of cold weather, this difficulty ceases. In organization, they are very much like the common snail, and their general habits are also very similar."

There is but one genus of this family found in Franklin county.

GENUS SUCCINEA, Drap.

Generic characters as given above. Shell oblong, oval, very fragile; spire produced; whorls but three or four, very rapidly enlarging; aperture oval, the simple lip united below by a broad curve with the thin, smooth, columella. Animal (Fig. 4) large, usually barely retractile within its shell; eye peduncles broad and thick, tentacles inconspicuous; foot broad. Respiratory foramen in the mantle in the angle at the posterior part of the aperture of the shell.



Fig. 4.

According to Tryon there are 200 species of this genus of world-wide distribution, living in damp places, near the margins of streams.

SUCCINEA AVARA, Say. Plate IX, Fig. 15.

Height 6 mm.; width 3.5 mm. Shell rather small, very thin and fragile, sub-ovate, straw-colored, rosy-amber, or greenish; periostraca shining or presenting minute hairy processes in the young; whorls three, rounded, with a deep suture; last whorl rather large, not much expanded; spire very prominent, acute; aperture sub-ovate, two-fifths of the whole length, rounded at both extremities.

It occurs in damp pastures and lawns, especially near water. Common. It is found over all eastern North America.

SUCCINEA OVALIS, Gould. Plate IX, Fig. 16.

Height 13.5 mm.; width 6 mm. Shell ovate-conic, very thin, pellucid, shining, pale-amber or water-horn color, sometimes roseate tinted; spire acute and short; periostraca shining, very minutely striate; whorls three, the last elongated; suture distinctly impressed;

aperture produced, broadly rounded, more than three-fourths as long as the entire shell; patulous, expanding anteriorly, exhibiting the interior of the volutions; broadest below the centre of the aperture. Animal a little longer than the shell; whitish or amber colored, and translucent with minute black dots on the surface.

It is found in Canada and the Northern and Middle States; and occurs on plants and among wet chips, in moist places. Common.

Family ARIONIDÆ.

Body elongated, attached its whole length to the upper surface of the foot. General characteristics and appearance like that of *Helix*, but differing from the latter in usually having a foot with a distinct locomotive disk and distinct posterior gland. Shell thin, shining or sometimes internal and rudimentary; ours large, depressed, brownish-chestnut color; peritreme acute, simple.

There are two sub-families here, characterized as follows:

Body elongated; shell entirely enclosed in the shield-like mantle, flat, oblong, not spiral; sub-caudal gland (mucus pore) lunate, transverse, horizontal *Arionina* (Slugs).

Body more or less spiral, and covered with a thin, shining, spiral shell. Sub-caudal gland (mucus pore) linear, perpendicular *Zonitina*.

Sub-family ARIONINÆ.

This sub-family includes the slugs, which have not yet been sufficiently studied for this county to be included in this paper.

Sub-family ZONITINÆ.

The only genus of this sub-family found in the county is *Zonites*.

Genus ZONITES, Montfort.

Shell spiral, orbiculate convex or discoidal, broadly umbilicated, striate or decussate above, smooth beneath, shining; whorls six to seven gradually increasing in size from the apex downward; aperture oblique and lunate; peristome thin, simple, brittle, acute, and slightly thickened internally. Animal spiral, foot elongated, all completely retractile within the shell; foot with a linear caudal mucus pore or slit.

Allied to *Hyalinæ* in general character and appearance of the shell, but distinguished from them by the presence of the caudal mucus pore.

The following species only is known to be in this county:

ZONITES FULIGINOSUS, Griffith. Plate IX, Fig. 17.

Height 13 mm.; width 22 by 26 mm. Shell rather large, thin, depressed on the upper surface, orbicular, pellucid, chestnut-brown, highly polished, somewhat wrinkled by lines of growth; whorls four and a half, rapidly increasing with irregular, oblique wrinkles, the

last whorl very voluminous increasing greatly toward the large, lunate-ovate, oblique aperture; peristome simple, thin, brittle, acute, with a light testaceous deposit within; extremities somewhat approximate; umbilicus moderate in width, deep, not much expanded, its margin furrowed by the transverse wrinkles which are not so conspicuous toward the periphery. Color varies from light waxen to dark chestnut, with a greenish tinge, somewhat streaked transversely; interior of mouth of shell pearly-rosaceous. Animal leadish-blue on the upper surface; head and tentacles darker; beneath, white, running into a cream yellow in the center.

It occurs in nearly all the Northern, Western, Middle and some of the Southern States and in Canada. It is found in rocky places and dry woodlands, also on hillsides sloping toward the north. This rare shell has been taken in this county in considerable numbers, but from the secluded habits of the animal living specimens are seldom met with.

SUBORDER LIMNOPHILA.

Shell usually covered by a corneous epidermis; oblong, few whorled, without operculum. Animal mostly fluvatile, sometimes amphibious or terrestrial; eyes sessile, at the base of the tentacles, which are sub-cylindrical or flattened or simply contractile.

Only the following family is represented here:

Family AURICULIDÆ.

Shell spiral, covered with an epidermis, solid, usually thick; spire more or less elevated; whorls sometimes flattened; aperture elongated, with strong folds on the inner lip; outer lip often dentate. Head ending in a snout; eyes sessile at the inner sides of the bases of the tentacles. Mantle closed, with a thickened margin; respiratory orifice posterior, on the right side. Animal most generally found frequenting marshes and the vicinity of the sea.

We have but one sub-family among our land shells.

Sub-family AURICULINÆ.

Animal terrestrial, living chiefly on the land; tentacles developed. Shell with inner lip plicate, outer merely thickened or expanded.

Only the following genus is found among our terrestrial mollusks:

Genus CARYCHIUM, Mueller.

Shell minute, conical, pupiform, very thin, transparent, hyaline, with but few whorls; aperture sub-oval with one tooth-like columellar fold which may be sometimes obsolete; parietal wall with one or two teeth; peristome expanded, its terminations not approximate, the right one with a small columellar fold.

Fifteen species of this genus are known; found over Europe, Africa, and the United States; also found fossil in the Jurassic.

CARYCHIUM EXIGUUM, Say. Plate IX, Fig. 20.

Height 1.5 mm, width .75 mm. Shell minute, elongated, cylindrical, tapering at both ends, white, translucent, shining; apex rather obtuse; whorls five to six, convex, very oblique, with quite minute transverse striae; aperture oblique, oval, with a plait on the columella and a slight fold near the junction of the lip with the umbilical extremity of the shell; lip thick, reflected and flattened; umbilicus open.

It is found among stones and fragments of wood, and especially among moss in damp places, is somewhat common here in drift. Scattered. It is our smallest mollusk. Occurs over the greater part of the United States.

ORDER PECTINIBRANCHIATA.

Mollusks with pectiniform branchiæ, *i. e.*, gills arranged in numerous, parallel laminæ like the teeth of a comb, and situated upon the upper wall of a respiratory cavity formed by the mantle, having an external opening upon the side of the neck. Sexes separated, in different individuals (dioecious). Shell spiral with an operculum.

The only family represented among our terrestrial mollusks in the county is the following:

Family RISSOIDÆ.

Shell small, spiral, turreted or depressed, often more or less umbilicated; aperture more or less rounded, never truly channeled in front; peristome continuous. Eyes at the outer sides of the bases of the elongated tentacles. Gills both pallial, the right one usually short and broad and composed of a few laminæ which are much broader than high; foot oblong, punctate before, rounded or pointed behind; operculum horny or somewhat shelly, spiral or concentric.

Found living in all kinds of water, sometimes amphibious and even sometimes terrestrial. Distribution mundane.

But one sub-family is represented by our land shells:

Sub-family POMATOPSINÆ.

Shell small, ovate or elongated, with a thick, corneous, sub-spiral operculum not provided with an internal process. Foot with lateral sinuses. Animal provided with a peculiar proboscis for reaching forward and stepping in its peculiar walking-like locomotion. Amphibious.

Only the following genus is known here:

0A
Genus POMATOPSIS.

Shell small, thin, smooth, elongated, sub-umbilicated; spire turreted; aperture ovate; peristome somewhat reflected. Operculum corneous. Tentacles short, subulate, pointed; rostrum large, longer than the tentacles and wrinkled transversely; foot broad, with lateral sinuses, verge very large, flattened, broad, spiral. Terrestrial. Found throughout eastern North America.

We probably have two species in this county.

POMATOPSIS LAPIDARIA, Say. Plate IX, Fig. 18.

Height 6 mm.; width 2.5 mm. Shell turreted, sub-umbilicated; whorls six, obsoletely wrinkled transversely; suture distinctly impressed; aperture longitudinally ovate-orbicular, operculated, more than one-third the length of the shell. Animal not as long as the shell, pale; head elongated into a rostrum used in the stepping locomotion.

It is found under stones, in moist situations, on the margins of rivers and ponds which are not dry in the summer seasons. It occurs ranging from New York to Georgia and from Missouri to Michigan; it is also found in the Post-pliocene formation of the Mississippi river bluffs.

POMATOPSIS CININNATIENSIS, Say. Plate IX, Fig. 19.

Shell rimate, somewhat obtuse; much more gibbous than *P. lapidaria*, and about twice as large, being 5 mm. high, and 2 mm. in diameter. Whorls four to six, convex; suture distinctly impressed; aperture rotund; lower whorl inflated.

Formerly somewhat common, but now becoming rare; found along the edges of ponds and streams and in other damp places under boards, logs and sticks.

I have some doubt as to the identity of this shell. Some authors consider it as synonymous with *P. sayana*.

EXPLANATION OF PLATES.

Most of these illustrations are reproduced from the papers of W. G. Binney, but some are from drawings by Miss Freda Detmers. The latter are marked Original in the following explanations:

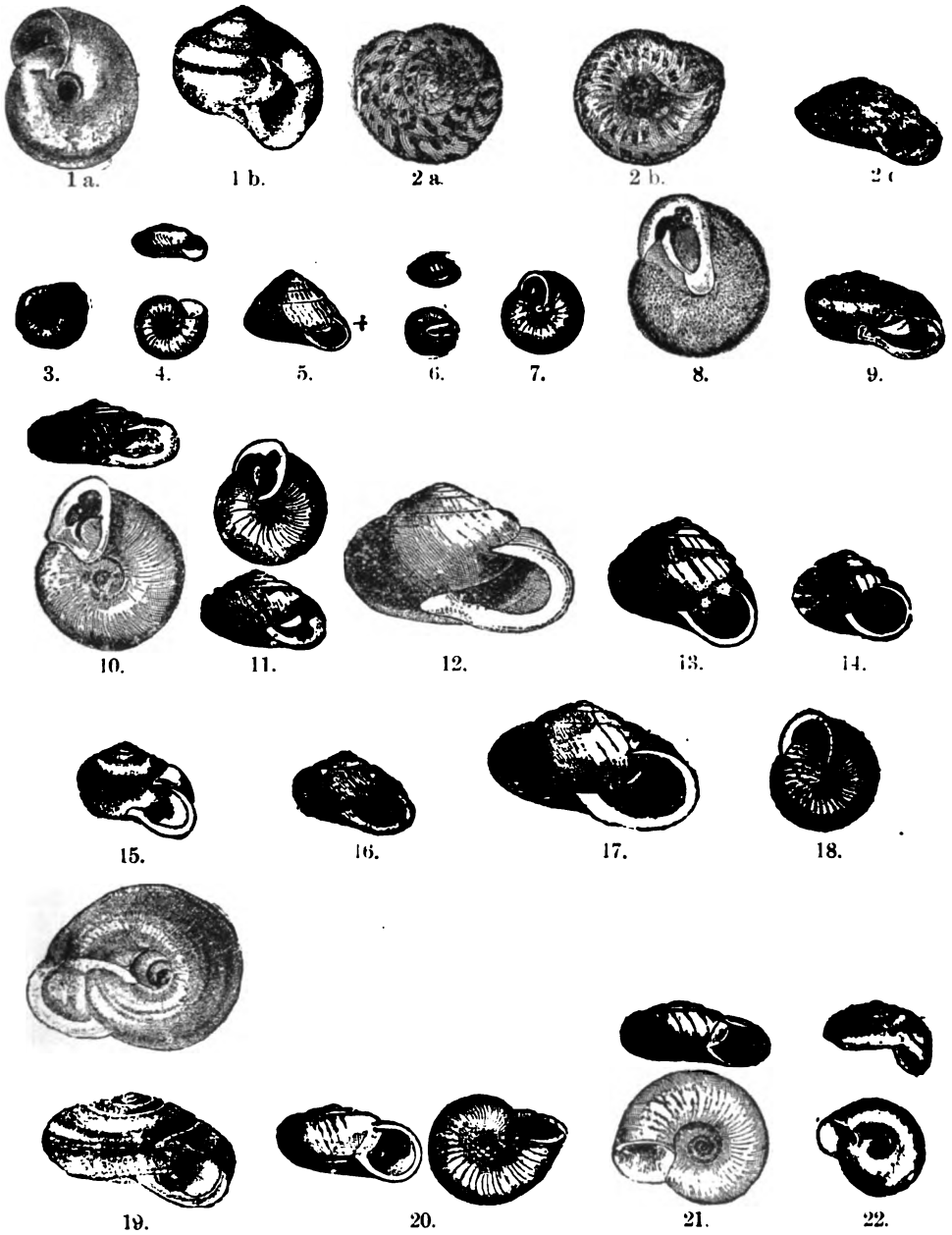
PLATE VIII.

- Fig. 1 a. *Helix solitaria*. Basal view. (Original.)
 " 1 b. " " Side " "
 " 2 a. *Helix alternata*. Apical view. Natural size.
 " 2 b. " " Basal " " "
 " 2 c. " " " " " "
 " 3. *Helix perspectiva*. Natural size. (Original.)
 " 4. *Helix striatella*. Side and basal views. Enlarged $\frac{1}{2}$ diameter.
 " 5. *Helix labyrinthica*. Enlarged six diameters.
 " 6. *Helix hirsuta*. Side and basal views. Natural size.
 " 7. *Helix monaon*. Natural size.

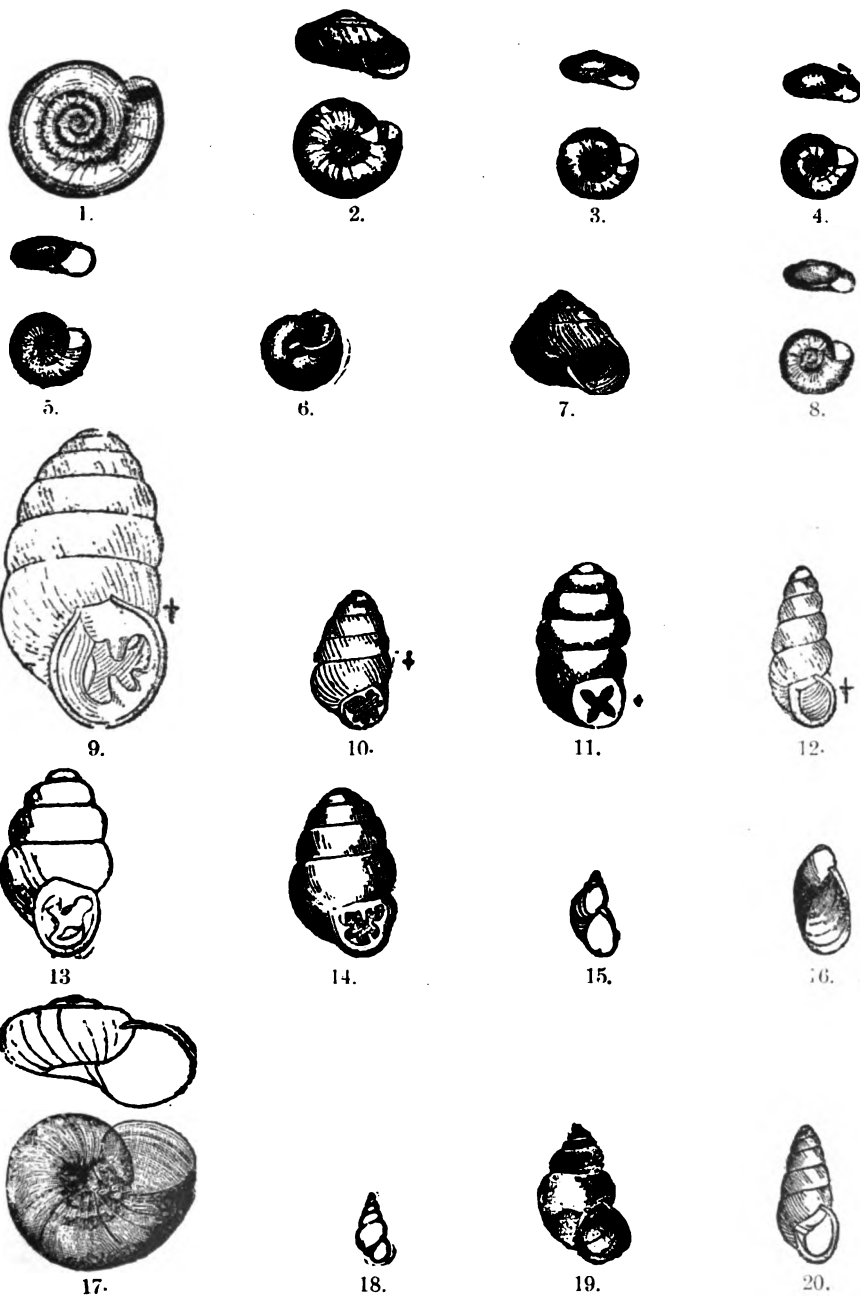
- Fig. 8. *Helix palliata*. Basal view. Natural size.
 " 9. " " Side " " " (Original.)
 " 10. *Helix tridentata*. Basal and side views. Slightly enlarged.
 " 11. *Helix fallax*. " " " " "
 " 12. " *albolabris*. Natural size.
 " 13. " *pennsylvanica*. " "
 " 14. " *clausa*. " "
 " 15. " " var. *mitchelliana*. Natural size. (Original.)
 " 16. " *thyroides*. Side view of a small specimen. Natural size.
 " 17. " " " " " large " "
 " 18. " " Basal " " " small edentate specimen. Natural size.
 " 19. " *profunda*. Side and basal views. (Original.)
 " 20. *Helix minuta*. " " " " Enlarged seven diameters.
 " 21. *Macrocyclus concava*. Basal and side views. Natural size.
 " 22. " " " " " " of a smaller specimen. (Original.)

PLATE IX.

- Fig. 1. *Helicodiscus lineatus*. Enlarged six diameters.
 " 2. *Hyalina nitida*. " two "
 " 3. " *arborea*. " " "
 " 4. " *viridula*. " " "
 " 5. " *indentata*. " " "
 " 6. " *intertexta*. Slightly reduced. (Original.)
 " 7. " *ligera*. Natural size.
 " 8. " *minuscule*. Enlarged four diameters.
 " 9. *Pupa armifera*. " ten "
 " 10. " *pentadon*. " " "
 " 11. " *decora*. " about nine diameters.
 " 12. " *fallax*. " four "
 " 13. " *contracta*. " ten diameters.
 " 14. *Vertigo ovata*. " " "
 " 15. *Succinea avara*. " two "
 " 16. " *ovalis*. Slightly enlarged.
 " 17. *Zonites fuliginosus*. Natural size.
 " 18. *Pomatopsis lapidaria*. Enlarged nearly two diameters.
 " 19. " *cincinnatiensis* (?) Enlarged four diameters. (Original.)
 " 20. *Carychium exiguum*. Enlarged twelve diameters.



LAND SHELLS.



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APRIL, 1893.

ENTOMOLOGICAL

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TABLE OF CONTENTS.

	Page.
Preface	150.
Article VII.—Methods of oviposition in the Tipulidæ. (Illustrated.).....	<i>F. M. Webster.</i> 151.
Article VIII.—A Dipterous Gall-maker and its Associates. (Illustrated.).....	<i>F. M. Webster.</i> 154.
Article IX.—Description of a new species of Gall-making Diptera. (Illustrated.).....	<i>John Marten.</i> 155.
Article X.—Description of a species of Chlorops reared from galls on <i>Muhlenbergia mexicana</i>	<i>S. W. Williston.</i> 156.
Article XI.—Notes of some species of Ohio Hymenoptera and Diptero heretofore undescribed. (Illustrated.).....	<i>F. M. Webster.</i> 157.
Article XII.—Descriptions of new Parasitic Hymenoptera bred by <i>F. M. Webster.</i> (Illustrated.).....	<i>Wm. H. Ashmead.</i> 159.
Article XIII.—A Tachinid reared from cells of a mud-dauber wasp.	<i>C. H. Tyler Townsend.</i> 165.
Explanation of plates.....	167.
Article XIV.—Additions to the Preliminary List of the Uredineæ of Ohio.....	<i>Freda Detmers.</i> 171.
Article XV.—Bibliography of Ohio Botany.....	<i>W. A. Kellerman.</i> 180.
Article XVI.—Experiments in the germination of treated seed.	<i>W. A. Kellerman.</i> 201.
Article XVII.—Analytical Synopsis of the groups of Fungi.	<i>W. A. Kellerman and Aug. D. Selby.</i> 206.
Article XVIII.—The Ohio Erysipheæ. (Illustrated.)....	<i>Aug. D. Selby.</i> 313.
Article XIX.—Corrections and additions to Moses Craig's catalogue of the uncultivated flowering plants growing on the grounds of the Ohio State University.....	<i>W. A. Kellerman and Wm. C. Werner.</i> 224.
Article XX.—Distribution of and Stations for a few rare and interesting Ohio plants.....	<i>Wm. C. Werner.</i> 232.
Article XXI.—New Plants for the Flora of Ohio...	<i>Wm. C. Werner.</i> 235.
Article XXII.—Notes on Rare Ohio plants.....	<i>Aug. D. Selby.</i> 241.
Article XXIII.—New or Rare Plants of Ohio.....	<i>W. A. Kellerman.</i> 241.

PREFACE.

The present number is a continuation of the series which was established in order to include the more technical work of the Station, not of especial interest to the ordinary farmer, but essential to Station workers. All of the botanical papers and the entomological papers by Mr. Webster form a part of the Proceedings of the Ohio Academy of Science. The former are included here, as they are directly in line with the work of the Station, and this series of our Bulletin has been selected as one of the official organs of the Ohio Academy of Science. They are not, however, to be taken as a portion of the work of the Station. The papers by Mr. Webster represent Station investigations, and the descriptive papers by Professors Williston, Townsend, Ashmead and Marten were prepared at our request and relate directly to the entomological papers, the descriptions of new species being published here for the first time.

ARTICLE VII.—METHODS OF OVIPOSITION IN THE
TIPULIDÆ.

BY F. M. WEBSTER.

Tipula bicornis Loew.

Authorities differ as to the mode of oviposition among the Tipulidæ; and it is not improbable that there may be a difference of method in different species. Curtis opined that the British species oviposited while on the wing, and Miss Ormerod says that *Tipula oleracea* Linn., oviposits in or on the surface of the ground, while Dr. Riley states that he has witnessed the oviposition of an American species, *Tipula trivittata* Say, and the eggs are forced into the ground by means of a double pair of valves, something as in the case of our common locusts.

In the species under consideration, the terminal abdominal segment of the female, Plate I, Fig. 4 *A*, is much more obtuse than in some other of the American species, ending in a pair of broad, concave valves or plates, Plate II, Fig. 1 *Aa*, whose office appears to consist in holding the eggs in place and assist in directing them to within the reach of a second pair of organs. With the female standing on a horizontal surface, in a natural position, the egg, Plate I, Fig. 7 *Ad*, which is concave on one side and convex on the other, appears to pass down the oviduct with the concave surface downward, but on nearing the terminus of the oviduct the posterior end of the egg is thrown under and backward, or toward head of the insect thereby bringing the concave side upward, and lying, seemingly, directly under a small liguliform plate, Plate I, Figs. 5, 6, *Ab*, which is attached only at its base. The apical portion of this triangular plate appears to fit the concave side of the egg, which is prevented from going too far backward by the anal valves previously mentioned. It is here that the second pair of plates or valves, Plate I, Fig. 6, *Ae*, apparently the most important appendage, is called into play. This is situated just beneath or a little back of the triangular plate, their bases having very nearly a common origin, and is composed of two movable valves, or claspers (whose base is broadened into a thin flap, which, coming upward at the sides, forms a receptacle for the egg) which, when closed together, form a hemispherical cup having almost the exact form of one-half of the epicarp of the hickory nut; and each of the two parts, when opened, as faithfully represent one of the valves of the epicarp. When the egg is in position on the triangular plate these valves are pressed against and about it, inclosing it on all sides, leaving only a portion visible along the apex; and dropping downwards slightly, but gently, the egg is projected forth with a slight snapping sound, seemingly propelled in much the same manner as one would eject the pit from a ripe cherry by pressing it

between the thumb and forefinger. Whether the liguliform plate follows the valves in this downward movement, or not, I could not determine, but think such is the case, as the egg is not projected directly backward, but deflects considerably downward. The movements of oviposition are made so quickly that it is exceedingly difficult to observe the exact action of the parts, and therefore I give them as they appeared to me. Further observation may require a slight revision.

I have an idea that the two elevations at the base of the liguliform plate, which is drawn as seen from beneath, may serve to keep the egg from slipping backward and may also assist in pushing it forward. At the base of plate, Plate II, *Aa*, Fig. 2, on the under side at *x*, are two loose appendages fixed at base and middle, forming, as it were, a sort of basal pocket for each of the claspers. The exact use of these I can not understand, but suspect they assist in some manner in holding, or, possibly, propelling the egg, as, in *Pachyrrhina*, they are reduced to what appears to me to be a mere cushion.

I wish it distinctly understood that I did not witness oviposition, except under artificial environments, and therefore it would not be best to take too much for granted. But, in view of the mechanism of the organs of oviposition, and the manner in which they are called into play, together with the fact that in the breeding cages the eggs were scattered about, without the least indication of a desire to secrete them, it seems at least doubtful about this species ovipositing in the ground, though it must be confessed the organs of oviposition have a strange resemblance to those of female locusts. There is, also, another, seemingly quite significant fact connected with the habits of oviposition in this species. While great difficulty was experienced in getting females of species having the upper plates or valves prolonged to a sharp point, to oviposit in confinement, these did so very readily, not appearing to care where the eggs fell, and when placed on a table it was found that some of them were projected a distance of ten inches. It would seem at least likely that if the life of the young larvæ depended upon the eggs being placed in the ground, there would have been some aversion, such as seemed to have been shown in *Pachyrrhina*, *Tipula costalis* and *T. angustipennis*, exhibited against their sacrifice.

The egg.—The egg is 0.8^{mm} in length, and from 0.3 to 0.4^{mm} in breadth, elongateovoid, strongly concave on one side and convex on the other, of a jet black color and highly polished.

Pachyrrhina sp?

PLATE II, FIGS. 3, 4.

The organs of oviposition in this species are very different from those of the preceding, giving to the posterior segment of the females a very different appearance. Instead of the broad valves we have a pair of

chitinous forceps, Plate II, Fig. 2, *Ba*, while the lower plates are produced with the prolongations vertically flattened, and the base forms an elongate receptacle, Plate III, Fig. 1, *Be*. The liguliform plate, Plate III, Fig. 2, *b*, is less robust and partakes more of a cartilaginous than a chitinous nature, its office evidently being in part sustained by the teeth with which the interior basal part of the second pair of plates is provided. The two pair of plates, when not in use, close up and form a slender prolongation of the last abdominal segment. The egg, Plate II, Fig. 5, *Bd*, differs from that of the preceding species by being smaller and having five distinct grooves, presumably allowing the teeth of the lower plates to gain a stronger hold on the egg itself, and thus reënforcing the liguliform plate, which, as in the preceding, seems to fit into the concavity of the egg. The manner of oviposition is as follows: The egg, leaving the oviduct, drops into the second or lower pair of claspers and under the small liguliform piece, the concave side upward. Here it seems to be held in place while the upper organ or plate is drawn backward, the lower being at the same time slightly advanced until the two flattened prolongations drop in between the two upper ones, when there is a sharp click and the egg is thrown forth at an angle of probably 40 degrees. As with the preceding species, the rapidity of the movement renders it difficult to observe accurately or to determine the exact source of propulsion. The females of this species utterly refuse to oviposit in confinement, and it is only by capturing them in the fields, after they have probably begun oviposition, that one is able to secure eggs. Even here, however, we have not been able to witness undisturbed oviposition, and therefore not able to observe whether or not they use the combined organs with which to place the eggs in the earth, as their general contour would indicate might be the case. More especially does this seem possible as the preceding species, whose organs of oviposition do not seem fitted for placing eggs, oviposit freely in the breeding cage. Besides being grooved, the eggs of these *Pachyrrhinæ* are smaller and less robust than those of *Tipula bicornis*. The number of eggs which the female produces is also uncertain, as I have not been able to secure accurate data on that point.

Except those of the *Pachyrrhina*, I have found no eggs with grooves, though all are concavo-convex. Whether this curious, boat-shaped form has been brought about by necessities growing out of changes of environment and of the organs of oviposition, or whether the eggs are thus formed to meet another and entirely different requirement, it is just now quite impossible to say. These insects are now almost semi-aquatic in the larval stage. In Illinois, Indiana and Ohio I always find the larvæ especially abundant in low, flat, wet lands. In Louisiana, I found larvæ in limited numbers in the running water of ditches, and Dr. Riley told me some years ago that he had in his collection a larva obtained some leagues at sea. Besides, the larvæ of *T. costalis* has lived for weeks in glass jars with clover roots, both being submerged in water, and the

former often floated about in a vertical position after the manner of many other, aquatic, Dipterous larvæ. Whether these eggs were thrown by accident into a pool of water by the female of *T. bicornis* or whether washed out of the ground in which they had been deposited by other species, they would be to some extent protected by their peculiar form, and would, therefore, the more readily float to the edges of such pools which, being thoroughly saturated with water, would fulfill all of the requirements of the young larvæ.

Whoever undertakes a systematic study of this interesting group of insects will certainly find in the organs of oviposition in the females some excellent characters for defining species. The males I have not studied but infer that here, too, some excellent characters might be found.

ARTICLE VIII.—A DIPTEROUS GALL-MAKER AND ITS ASSOCIATES.

BY F. M. WEBSTER.

Under the caption of "Insects Reared from Galls on *Muhlenbergia Mexicana*," I presented a short note at the Rochester meeting of the Entomological Club of the American Association for the advancement of Science, in which was given a list of these insects, that, up to that time, had only been hastily determined as to genera. I wish now to present a more detailed and finished report on this matter, as it very forcibly illustrates the riches which awaits the careful investigation of the insect fauna of this State. There can be no doubt but that the author of this gall (Plate II, Fig. 6) is a species of Diptera belonging to the family Cecidomyiæ. It may henceforth be known as *Lasioptera muhlenbergiæ* Marten, and the original description follows on page 155. This was not, however, the first to appear, as my first rearing was a species of *Chlorops* which may now be known as *Chlorops ingrata* Williston, described on page 156. This was followed by a species of *Pteromalus*, a genus in which the species are in much confusion, and hence this one cannot now be clearly identified. My next prize secured was *Ericydnus maculipennis* Ashmead, n. sp., see page 162. This is clearly a parasite on the *Chlorops*, and, strangely enough, while I secured a large number of specimens, every one was a male. Next came the *Lasioptera* and these were closely followed by *Megorismus lasioptera* Ashmead, n. sp., see page 160 a parasite on the gall maker. This list is probably correct and is to be taken as a revision of that published in Canadian Entomologist, Vol. XXIV, p. 243, which was based on determinations made for me at the Department of Agriculture at Washington. The Oscinid, there mentioned, turns out to be a *Chlorops* and the Euratomid and Eupelmus are

both *E. maculipennis* Ashmead. Among the bracts of the gall were many eggs of a species of Orthoptera, and in all probability those of one of the Katy-dids, the female having used this gall, as she does those on willow, for the purpose of secreting her eggs. Habitat, Ill., Ind., Ohio, Canada.

While preparing a description of this species I learned that Prof. Marten had also studied it in Illinois, and had included his description in a paper to be published in the Bulletin of the Illinois State Laboratory of Natural History. Through the courtesy of Prof. S. A. Forbes, Director of the Laboratory, this description was withdrawn and is published in the following pages.

Just as this Bulletin is ready for the press I have had the pleasure of examining another lot of galls, received from Prof. McFadden, March 27, 1893. These were, with one exception, what I had supposed to be aborted galls. On close examination, I found that the supposed perfect gall, only, contained larvæ of Lasioptera, while the supposed aborted galls, each near the crown of base, contained a single puparia in a vertical position. From these last I invariably rear the Chlorops, which tends to prove that these are two distinct species of galls formed by two species of Diptera, the one figured in Plate II, Fig. 6, being that of *L. muhlenbergiæ*, the other by *C. ingrata*.

In the stems of this last consignment of galls I find evidences of their having been inhabited by a larva, and it is possible that he who follows this interesting matter farther will be rewarded by rearing another inhabitant—a phytophagus species allied to *Isosoma*.

ARTICLE IX.—DESCRIPTION OF A NEW SPECIES OF GALL-MAKING DIPTERA.

BY JOHN MARTEN.

Lasioptera muhlenbergiæ, n. sp.

Female:—Length 3 to 3.5^{mm}. General color pitchy black or brownish black. Antennæ 19 (17+2) jointed, black, fading to dusty towards the tips; joints short, sessile, clothed with short hairs; basal joints tinged with yellowish brown. Face tinged with yellowish brown, and having a silvery white reflection in certain lights; it also has a few scattered black hairs. Thoracic dorsum shining pitchy black with some reddish brown about the base of the wings and on the posterior angles of the mesothorax. Scutellum black with reddish brown margins, somewhat transparent in appearance. Metathorax and pleura reddish brown, the latter with a black spot commencing anterior to the base of the wing and reaching, with a slight interruption, to the middle coxa. Halteres

yellowish, with the head and outer part of the pedicel covered with pitchy black scales which give them a dense black appearance. Wings dusky; costa and the first and second longitudinal veins so densely covered with black scales and hairs as scarcely to be distinguished when the scales are intact; base of wing pale yellowish. Coxæ and femora yellowish; distal half of femora with black scales, becoming more dense towards the apex; tibiæ and tarsi completely covered with black scales. Abdomen reddish brown in ground color, densely covered with pitchy black scales; scales less dense on the venter; ovipositor reddish yellow, becoming pale yellow, almost white at the tip.

Male:—About the same length as the female, but more slender. Not nearly so black in general color as the female, but smoky or very brown, black with a pitchy reflection. Antennæ 16 to 18 (14+2 or 16+2) jointed.

Described from numerous reared specimens that emerged from imbricated, leafy galls formed of aborted lateral branches on *Muhlenbergia Mexicana*, at Champaign, Ill. Specimens emerged from May 9 to June 10, 1892. By the abortion of the branch the leaves are brought close together, overlap each other and form a cone shaped gall, Plate II, Fig. 6. The larvæ lie singly or several together on the inner bases of the leaves forming the gall. They are of a peculiar pale yellowish color.

The pupa is reddish yellow, becoming darker reddish or even orange colored with age. When ready to pupate the old larval skin is pushed down to the tip of the abdomen where it remains adhering to the last segment. The pupa forms rapidly and without a puparium. The thin pupal skin is usually left attached to the old larval skin when the imago emerges.

There is but one generation in the year, the winter being passed in the larval stage.

ARTICLE X.—DESCRIPTION OF A SPECIES OF CHLOROPS
REARED FROM GALLS ON MUHLENBERGIA MEXICANA,
BY F. M. WEBSTER.

BY S. W. WILLISTON.

Chlorops ingrata n. sp.

Male, Female :—Yellow, but little shining; three dorsal stripes, a supra-alar vittula, the posterior margins of the abdominal segments, two occipital lines, and small spots on the pleuræ, black; frontal triangle very large, luteous. Length 3-3½^{mm}.

Vertex triangle very large, reaching acutely to the anterior margin of the front; in the male nearly contiguous above with the eyes; shining

luteous, with a deep median groove. Face strongly receding, the margins of the facial ridges and of the cheeks, brown; cheeks very broad. Third joint of antennæ rounded, blackish on the upper margin. Thorax yellow, but little shining, clothed with short black hairs; the rather broad corsal stripes, a supra-alar vittula, a small humeral spot, three or four pleural spots, and the metanotum, black. Abdominal segments each with a broad posterior black band. Femora black or dark brown, the tips and the tibiæ yellow or yellowish; the middle portion of the hind tibiæ, and all the tarsi brown or brownish. Wings cinereous hyaline, the third and fourth veins divergent.

Two specimens, Ohio, Prof. F. M. Webster.

ARTICLE XI.—NOTES ON SOME SPECIES OF OHIO HYMENOPTERA AND DIPTERA HERETOFORE UNDESCRIBED.

BY F. M. WEBSTER.

The following new species of parasitic Hymenoptera and Diptera, though for the most part described in another part of this bulletin, and the host insects, or host plants, as the case may be, are usually given by the authors, yet in some cases additional notes may be added that may be of value to those who study them from a biological standpoint. In a very few cases I have included descriptions of species found outside of the State, but these will more than likely be found here sooner or later.

Heptameris oscinidis. This is given as a parasite on *Oscinis variabilis*. There is as yet some uncertainty about the validity of the species to which we are giving this latter name. There is no doubt about this being a host of *H. oscinidis*, but two other species of *Oscinis* occur in this locality in company with *variabilis*, and I have reared all of them from the same lot of young wheat. One of these is *O. umbrosa* Loew, described from Pennsylvania, and the other is as yet undetermined. All are abundant in wheat fields, and the puparia in spring are found in the same locality on the plants as are those of the Hessian fly.

Apanteles orgyia. This might almost be termed an egg parasite, as they were reared from the hibernating chrysalis of the female *Orgyia*, which is little more than a sack of eggs. An undetermined species of *Pteromalus* is likely to prove a secondary parasite.

Megorismus lasioptera. There is no doubt about the male of this being a parasite on *Lasioptera*.

Meraporus bruchivorus. This may prove to be exclusively a western species, though it is not unlikely to be parasitic on other species of the genus *Bruchus*.

Catolaccus tylodermae. As the host, *Tyloderma foveolatum*, is everywhere abundant, in this State, breeding in the stems of the Evening Primrose, *Oenothera biennis*, it is sure to be found within the State in the near future.

Arthrolytus apatela. I found on September 10, a specimen of this species under the body host, which had in this case evidently been killed by *Rhogas intermedius* Cress. It does not appear to be abundant.

Ericydnus maculipennis. This must be parasitic on *Chlorops ingrata*. Though I reared over fifty examples not a single female was to be found among the number. Therefore the female is yet to be discovered.

Encyrtus clisiocampa. This is, I believe, the first species of this genus to be reared from eggs of *Clisiocampa*. Though reared from eggs from Indiana it will doubtless be found in Ohio also.

Websterellus tritici. Plate II, Figs. 1 and 2. This will, I feel quite certain, prove to be a very useful parasite on *Isosoma hordei*, and is not itself phytogallus and the true gall maker. My reasons for this belief have from the beginning been, (1st.) That it emerges at the wrong season of the year to be a true wheat insect, there being no growing grain at the time in which the females could oviposit. (2d.) That I have observed them ovipositing in the galls from which they emerged. (3d.) That all of the other parasites reared from these galls, viz., *Semiotellus chalcidiphagus*, *Merizus isosomatis* and *Eupelmus allynii* are all of them parasitic on species of *Isosoma*. (4th.) That the general form of these galls, Plate III, Figs. 3 and 4, except in some minor features, agree with those of the normal form of *I. hordei* as given by Harris and Fitch. The species seems quite abundant in the vicinity of Wooster, Ohio.

Besides the foregoing, I have reared the following, descriptions of which have not yet appeared. The determinations are those given me by the Entomologists of the U. S. Department of Agriculture, and while a special agent of the Division of Entomology.

Elachistus websteri Ashmead, *M S.*

Hemiletes drassi Howard, from eggs of spiders.

Haltichella sp. from *Solenobia walshella*.

Aphelinus mali Hald. This species was described in 1851, from specimens of the female, but the male has heretofore been unknown. Both sexes were reared by myself from *Mysus mahaleb* infesting young turnip plants, in the insectary.

Chlorops ingrata, reared from independent galls on *Muhlenbergia* as has been already explained in another paper.

Sarcomacronychia trypoxylonis. This was reared at Columbus, Ohio, from mud cell collected by my assistant, Mr. J. S. Hine. On my removal to Wooster, the cells were left in the care of Mr. Hine, who reared from them two specimens of *Trypoxylon politum* Say.

ARTICLE XII.—DESCRIPTIONS OF NEW PARASITIC HYME-
OPTERA BRED BY PROF. F. M. WEBSTER.

BY WM. H. ASHMEAD.

Family CYNIPIDÆ. Genus HEPTAMERIS FÖRSTER.

(1) *Heptameris oscinidis* sp. n. ♀ Length 1^{mm}. Black, highly polished impunctate; legs and the six basal antennal joints reddish yellow wings hyaline, strongly fringed. The antennæ are as long as the body, 13-jointed, the seven terminal joints stouter than the preceding, about three times as long as thick, the last being slightly the longest, the four funicular joints very slender, nearly of an equal length, the first being very slightly the longest. Thorax very slightly shorter than the abdomen, the mesonotum highly convex without furrows and a little longer than wide; scutellum foveated at base, the small oval cup on disk surrounded by striæ, the cup itself smooth and polished with a small fovea at apex. Marginal cell of anterior wing large; the first abscissa of the radius slightly curved and a little shorter than the second, the latter straight.

Described from 2 ♂ specimens reared by Prof. F. M. Webster, at Wooster, Ohio, from the larva of *Oscinis variabilis* living in the stems of wheat.

Family BRACONIDÆ. Genus APANTELES FÖRSTER.

(2) *A. orgyia* sp. n. ♀ Length 2.2^{mm}. Black, shining, finely sparsely pubescent; mandibles, palpi and legs, except hind coxæ, reddish-yellow, or yellowish; scape black; flagellum brown-black or dark brown; wings hyaline; tegulæ, costæ and stigma, pale brownish-yellow, the internal nervures pale or hyaline.

Head transverse much narrower than the thorax, a little more than twice as wide as long, the vertex convex, smooth, with occipital margin rounded and feebly, sparsely punctate; ocelli prominent, red; face below antennæ slightly prominent, with a median carina but not sharply defined, the surface shining but feebly rugulose or alutaceous; clypeus with a distinct, small, rounded fovea on each side at the basal lateral angles; cheeks rounded, feebly sparsely punctate, the punctures more distinct and confluent near the malar furrow. Antennæ as long as or a little longer than the whole insect, slender and very gradually acuminate toward tips; scape about 2½ times as long as thick, black, except at juncture with the head; annulus minute, yellowish; flagellum dark brown, covered with a short fine pubescence, the first three joints about equal in length, nearly four times as long as thick, the following joints very gradually subequal to the last, the last very slender, conic, and only a little longer than the preceding.

Thorax shining, punctate, the punctures confluent only anteriorly, sparser and feebly defined towards the scutellum; scutellum smooth,

shining, impunctate with a crenulate furrow across its base; metepisternum triangular, punctate along the margins; mesopleura with a long deep femoral furrow, smooth and shining except anteriorly and beneath the tegulæ, the surface here being punctate; metathorax coarsely rugose, impressed on each side of the middle posteriorly and without a distinct median carina, although the pleural carinæ are more or less distinctly defined; metepisterna smooth, polished, the pleura being coarsely rugose and between these two sclerites there is a large deep fovea.

Legs, except the hind coxæ, uniformly reddish-yellow, rarely with a faint dot at tip of posterior femora above; tibial spurs scarcely half the length of first tarsal joint.

Abdomen not longer than the thorax, flat above, carinate and compressed towards apex beneath, the hypopygium being prominent and plow-share shaped, the ovipositor hidden or with only the tip exposed. The abdomen appears entirely black, but in the coxal furrow or the depression caused by the large hind coxæ, (being the sides of the first, second and third ventral segments) it is reddish piceous. Shield of first dorsal segment trapezoidal, as wide as the segment and as long as the second and third segments united, the latter sub-equal; the first and second segments are rugose, the following all smooth, polished.

Hab.—Ohio.

Approaches apparently nearest to *A. Koebelei* Riley, but differs in color of the legs, sculpture and in the structure of the dorsal abdominal segments, the second being without the oblique furrows.

Bred by Prof. F. M. Webster from the hibernating chrysalis of *Orgyia leucostigma*.

Family CHALCIDIDÆ. Subfamily PTEROMALINÆ. Genus MEGORISMUS
Walker.

(3) *M. lasioptera* sp. n. ♂ Length 2.8^{mm}. Golden green, closely punctate; sides of thorax, except the posterior part of the mesopleura, and the metathorax, bluish-green; scape, pedicel, mandibles, and legs, pale ferruginous.

The head is transverse wider than the thorax with a broad vertex, the lateral ocelli a little closer to the margin of the eye than to each other. Antennæ subfiliform, 13-jointed, the pedicel small, the first funicular joint the longest and about twice as long as the pedicel, the following joints very gradually becoming shorter, the last being a little wider than long; club a little longer than the last two funicular joints united. Pronotum transverse, quadrate, narrower than the mesothorax and anteriorly triangularly contracted at junction with the head; mesonotum with furrows entire but delicately indicated posteriorly; scutellum with no cross-furrow; metanotum long, rugose, and with 3 carinæ. Wings hyaline, the tegulæ and venation pale ferruginous, the marginal vein slightly shorter

than the postmarginal, stigmal oblique, subclavate, and nearly as long as the marginal. Abdomen oblong-oval, bronzy-green, petiolated, the petiole stout, about twice as long as thick, rugose, with a delicate longitudinal carina above; first body segment the longest, almost as long as the following united, smooth, the following segments subequal and under a strong lens exhibiting a finely reticulate sculpture.

Hab.—Westerville, Ohio.

Described from a single male, bred from a Cecidomyiid larva, *Lasioptera muhlenbergiae*.

Genus MERAPORUS Walker.

(4) *M. bruchivorus* sp. n. ♂ ♀. Length 2 to 2.5^{mm}. Black, sometimes approaching blue-black, closely punctate or granulate and covered with sparse, short, white hairs, the head behind the ocelli with fine, transverse, grooved lines; knees, tips of tibiae and the tarsi, except the terminal joint, white or light honey-yellow; abdomen æneous.

The head is transverse, a little wider than the thorax, with the cheeks and lower part of the face smooth. Antennæ, except extreme base of the scape, or at its origin, brown-black, subclavate, pubescent, the first funicular joint small, shorter than pedicel or the following funicular joints, the others very slightly longer than wide. Metathorax with a prominent neck. Wings hyaline, the venation yellowish, the marginal vein nearly twice as long as the stigmal, the postmarginal only one-third longer than the stigmal. Abdomen conic-ovate, about as long as the head and thorax united, or very slightly longer. The male has all the tibiae, except sometimes the anterior pair, brownish; the marginal vein is only a little longer than the stigmal; the abdomen is oblong-oval; while the antennæ are covered with a denser pubescence.

Hab.—Manhattan, Kansas, Lafayette, Indiana, Spirit Lake, Iowa.

This species was first sent to me several years ago, by Mr. C. L. Marlatt, of Manhattan, Kansas, who reared it from a *Bruchus*, living in the seed pods of some plant in that state. Prof. F. M. Webster has recently reared it from *Bruchus exiguus*, living in the seeds of *Amorpha fruticosa* collected at Spirit Lake, Iowa, by Dr. J. C. Arthur.

Genus CATOLACCUS Thompson.

(5) *C. tylodermæ* sp. n. ♂ ♀. Length 3 to 3.6^{mm}. Dull brownish to bluish-black, closely punctate and covered with exceedingly short, sparse white hairs; abdomen, in ♀, conic-ovate, longer than the head and thorax united, metallic, at base above cupreous, towards apex and beneath bluish; scape and legs pale ferruginous or brownish-yellow, the coxæ and femora, except distal ends, brown-black or submetallic, the tibiae at the middle more or less brownish or obfuscated; flagellum brown, subfiliform, the first funicular joint the longest, about 2½ times as long as thick,

the following joints gradually subequal. Metathorax very short. Wings hyaline, the venation yellowish, the marginal vein long, about three times as long as the stigmal, or one-half longer than the postmarginal.

The male is the smaller and differs in having the tibiæ usually pale, or exhibiting only a dusky spot toward the base, the abdomen being long-oval, about two-thirds the length of the thorax, much depressed, bluish, but ferruginous or brownish above and beneath towards base.

Hab.—Indiana, and Ithaca, New York.

This species has been reared in Indiana by Prof. Webster, and at Ithaca, New York by Mr. F. H. Chittenden, from the larva of a Coleopteron, *Tyloderma foveolatum*.

Genus ARTHROLYTUS Thompson.

(6) *A. apatelæ* sp. n. ♀. Length 1.5^{mm}. Black, shining, although exhibiting a fine scaly punctation; scape and legs, honey-yellow, or pale ferruginous; all femora, and the posterior tibiæ broadly at the middle, brown; flagellum subclavate, brown. The head is broad, much wider than the thorax, the vertex being broad and rounded. The antennæ are inserted a little below the middle of the face, the funicular joints being short, not or scarcely longer than wide, the club somewhat large, fusiform. Thorax short, the mesonotum being about twice as wide as long, with the parapsides indicated only anteriorly; collar distinct but narrowed medially; scutellum convex; metathorax short. Wings hyaline, the marginal vein twice as long as the stigmal, the postmarginal not longer than the stigmal. Abdomen conic-ovate, a little longer than the head and thorax united.

Hab.—Wooster, Ohio.

Bred by Prof. Webster, from the larva of *Apatela populi* Riley.

Genus ERICYDNUS Walker.

(7) *Ericydnus maculipennis* sp. n. ♂.—Length 3 to 3.1^{mm}. Brownish-yellow; eyes, scutellum and mesopleura posteriorly dark brown; metathorax and abdomen, except at base, blue-black; triangular piece before the tegulæ and the legs except sometimes the middle tibiæ outwardly and the hind femora and tibiæ, except the basal one-third, which are fuscous, honey-yellow; anterior wings with the apical two-thirds, except two triangular nearly confluent spots at the middle, fuscous, the basal one-third and the two triangular spots hyaline. The head is wider than the thorax, the surface microscopically shagreened with a few scattered punctures; ocell 3 in a triangle, all the same distance apart but the laterals almost touching the eye. Antennæ 11-jointed, subfiliform. Thorax convex, shining with a sparse microscopic pubescence, pronotum sub-triangular, the posterior margin triangularly emarginated; scutellum convex, twice as long as wide at base, the axillæ meeting at the base.

Middle legs the longest, the tibial spurs as long as the first tarsal joint. Abdomen oblong-ovate, as long as the thorax.

Described from several males reared by Prof. Webster from *Chlorops ingrata*.

Subfamily ENCYRTINÆ. Genus ENCYRTUS Dalman.

(8) *E. clisiocampæ* sp. n. ♀.—Length 0.8^{mm}. Æneous or dark bronzy-green; the mesopleura blue-black; tip of scutellum violaceous; antennæ, coxæ, femora, and tibiæ toward base outwardly, pale brown; rest of legs light honey-yellow. The whole surface is smooth, shining; the axillæ do not quite meet at the base of the scutellum; the eyes slightly converge toward the mouth; the vertex not especially widened; the lateral ocelli close to the eye, while the anterior ocellus is on the extreme margin of the facial impression. Antennæ 11-jointed, subclavate, the funicular joints scarcely longer than thick, the first two united being only as long as the pedicel, while the club is fusiform not obliquely truncate. Wings hyaline, the margins not fringed, the marginal vein punctiform, the postmarginal scarcely longer, while the stigmal is subclavate about twice as long as the marginal. Abdomen sessile, short, subtriangular, not quite as long as the thorax, æneous, the membranous attachment to the metathorax, which is visible as a narrow fold, being whitish or carneous.

In the male the legs are pale, the femora and tibiæ being only slightly dusky, the abdomen being smaller and much depressed, while the antennæ are subfiliform, paler brown, with a long pubescence, the funicular joints being from $1\frac{1}{2}$ to 2 times as long as thick. Hab.—Franklin, Indiana.

Bred from the eggs of *Clisiocampa distria* Hbn.

(9) *E. pleuralis* sp. n. ♀.—Length 1.5^{mm}. Æneous black or sub-metallic; tip of scutellum somewhat cupreous; head black; scape, mesopleura and legs, ferruginous, the posterior femora obfuscated; thorax smooth, impunctured. The head, on vertex, is distinctly punctate, the lateral ocelli almost touch the eye while the eyes are large, rounded, pubescent. Antennæ 11-jointed, clavate, the flagellum brown-black, with the funicular joints wider than long. Wings hyaline, pubescent, and with a short cilia at margins, the marginal vein about $2\frac{1}{2}$ times as long as thick, (or as long as the stigmal with its club), brown, post-marginal scarcely longer. Abdomen sessile, ovate, about as long as the thorax. Hab.—Wooster, Ohio.

Described from a single specimen, bred by Prof. F. M. Webster from a bracket-like fungus found on a stump, infested with the larvæ of Atomaria and other fungous beetles.

The funicular joints in this species closely resemble those to be found in the genus Aphycus, but otherwise it resembles Encyrtus.

2. Ex. STA.—T. S.

Family. TORYMINÆ. WEBSTERELLUS gen. nov.

Stature and general appearance of *Monodontomerus* Westwood, with a similar venation and with the hind femora armed with a single tooth beneath toward apex; but the prothorax, although large, is more rounded anteriorly, the scutellum has no transverse furrow behind the middle, the metathorax with oval spiracles, the hind coxæ very long, while the abdomen is sessile, in female conically produced with a long ovipositor, in male oblong oval. In both sexes the first segment is the longest with the posterior margin incised at the middle.

The genera in the Toryminæ with the posterior femora toothed Plate I. Fig. 3, are: (1) *Monodontomerus* Westwood; (2) *Diamorus* Walker; (3) *Holcaspis* May; (4) *Oligosthenus* Förster; and (5) *Cryptopristus* Förster, all of which except the last are represented in my collection.

Websterellus is at once separated from the first two by the absence of a cross-furrow on the scutellum and by the incised first abdominal segment; from the third by a longer more oblique stigmal vein, shorter metathorax, longer posterior coxæ, the much longer conically produced abdomen and the incised first abdominal segment; and from the fourth and fifth by the shape of the abdomen, venation, and the incision of the first abdominal segment. In *Oligosthenus* the posterior margin of the first abdominal segment is straight in both sexes, while in *Cryptopristus* it is straight only in the male.

It has given me great pleasure to be able to dedicate this interesting new genus to my friend Prof. F. M. Webster, the discoverer, who is so well known for his valuable contributions to economic entomology.

(10) *Websterellus tritici* sp. n. (Plate II, Figs. 1, 2. Plate III. Figs. 3, 4). ♀.—Length 3 to 3.2^{mm}. ovip. 1.8 to 2^{mm}. Bluish green, confluent punctate, the upper part of head, the mesonotum and scutellum bronzed-green; the face, cheeks, sides of pronotum and abdomen, especially at sides, with a moderately dense white pubescence, the pubescence elsewhere sparse; all tibiæ and tarsi honey-yellow; wings hyaline, the female with a faint cloud beneath the stigmal vein; the venation brown, the marginal vein long, two-thirds the length of the submarginal, the post-marginal about two-thirds the length of the marginal, the stigmal a little shorter than the post-marginal at an oblique angle of about 20 degrees, and with a short vein at the tip which is directed towards the margin. Plate I. Fig. 1.

In the ♀ the antennæ are subclavate, 13-jointed, with the scape and club honey-yellow, while the abdomen is sessile, conically produced, nearly twice the length of the head and thorax united, the first segment being one-third its whole length, and the ovipositor is almost as long as the abdomen and thorax united,

The antennæ in the male are entirely black, with the flagellum filiform, stout, covered with a short dense pubescence, the pedicel being

very small, while the abdomen is oblong-oval not quite as long as the thorax, the first segment only as long as the 2d., 3d, and 4th, segments united. Plate I, Fig. 2.

Described from several specimens reared by Prof. F. M. Webster, at Wooster, Ohio, from galls on the stems of wheat.

ARTICLE XIII—A TACHINID REARED FROM CELLS OF A MUD-DAUBER WASP.

BY C. H. TYLER TOWNSEND.

The fly described below was sent me by Professor F. M. Webster, with the note "reared from nest of some species of mud-dauber wasp." The mud-dauber wasps of the more northern portions of the United States belong largely to the genus *Pelopæus*. In Texas, and other parts of the south, a wasp of the genus *Trypoxylon* builds narrow mud cells, arranging them not only side by side but end to end, thus forming long tubes. The cocoon of the *Trypoxylon* is tough, thick, and of a dark brown; while that of *Pelopæus* is thin, yielding, and golden brown in color (See 2d Rep. U. S. Ent. Com., p. 266). These points will serve to identify the cells of the two genera.

In reply to an inquiry concerning the mud cells from which the tachinids were bred, Professor Webster sent me a number of the cells. These I recognize as those of *Trypoxylon*. They are long, and obliquely ribbed on the outside, the ribs from each side meeting on the median longitudinal line. The cocoon is stiff, hard in texture, dark brown in color, thin and brittle, except that the tail end has a thick lighter colored cap within. It is enveloped in a small amount of silk. Many of the tachinid puparia were found in the débris of the cells. In one case two puparia were glued together side to side, the heads pointing the same way.

Sarcomacronychia trypoxylonis n. sp. ♂. Eyes and frontal vitta dark brown; front and sides of face deep golden; front slightly narrowed anteriorly, about one-fourth width of head; strongest pair of ocellar bristles directed strongly forward; the two posterior pairs of frontal bristles strongest, directed backward; the other frontal bristles about same size, mostly directed forward, in two rows on each side of front as characteristic of this genus; face and cheeks silvery, occiput cinereous; antennæ and arista black, third antennal joint about one and one-half times as long as second (or slightly shorter); proboscis brownish, base and tip lighter; palpi blackish, rufous in middle, cylindrical in shape. Thorax and scutellum silvery cinereous, with three heavy black vittæ continued on scutellum, clothed with bristly hairs and a few macro-

chaetæ; pteuræ silvery, with a black vitta from humerus to base of wings scutellum with an apical decussate pair of macrochaetæ, two lateral pairs, and some weaker bristles. Abdomen rather elongate oval, clothed with bristly hairs, blackish, anal segment rufous; segments one to three silvery on sides and beneath, and each on dorsum with a median pair of silvery pollinose spots or patches, leaving a more or less distinctly defined median dark vitta which is faintly continued on anal segment; anal segment more or less silvery pollinose, sometimes blackish on base (or greater portion in some badly preserved specimens); hypopygium blackish; segments one and two each with a median marginal and a lateral marginal pair of macrochaetæ, third segment with about ten marginal, and anal segment with a marginal row. Legs entirely blackish, femora slightly silvery, claws and pulvilli elongate. Wings grayish hyaline, venation typical; tegulæ whitish, with a pale straw-color tinge; halteres pale rufous, stalk darker.

♀. Differs in the short claws, the front less than one-fifth width of head anteriorly, and the general smaller size.

Length of body, 6-7½ mm.; of wing, 4½-6 mm.

Described from twelve specimens, reared from cells of a mud-dauber wasp, *Trypoxylon politum* Say, at Columbus, Ohio, by Professor Webster. Issued June 6, 1892. This species differs from *S. unica* Twins. by its pronounced golden front and sides of face; from *S. floridensis* Twins. by the same character and by its larger size; from *S. sarcophagoides* Twins. by the golden front and sides of face, smaller size, and less marmorate marking of the abdomen; and from *S. aurifrons* Twins. by its rufous anus. The front of the ♂ in this genus is wider than that of the ♀.

EXPLANATION OF PLATES.

PLATE I.

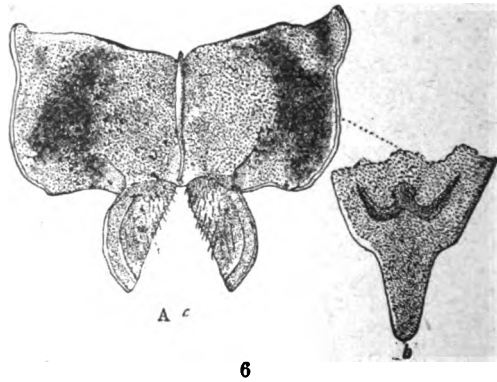
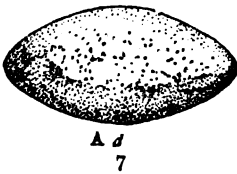
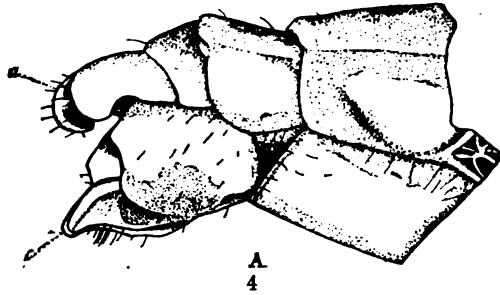
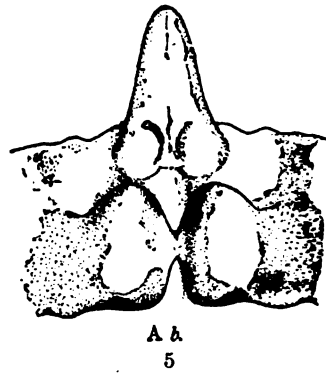
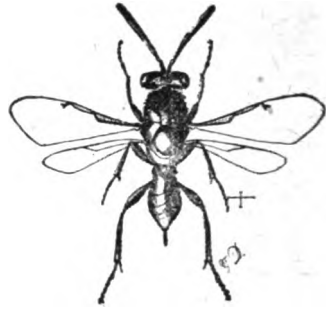
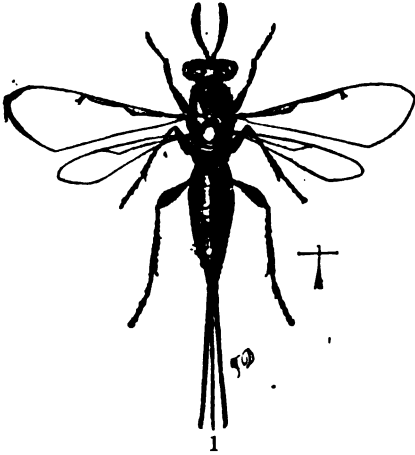
- Fig. 1. *Websterellus tritici* ♀.
 Fig. 2. " " ♂.
 Fig. 3. Posterier leg showing femoral tooth.
 Fig. 4. Organs of oviposition of *Tipula bicornis*.
 Fig. 5. Liguliform plate greatly magnified.
 Fig. 6. Lower valves showing position of liguliform plate.
 Fig. 7. Egg of *Tipula bicornis*, greatly enlarged.
 Figs. 1, 2, 3, 4, drawn by Miss Detmers. Figs. 5, 6, 7, by Mr. John S. Wright.

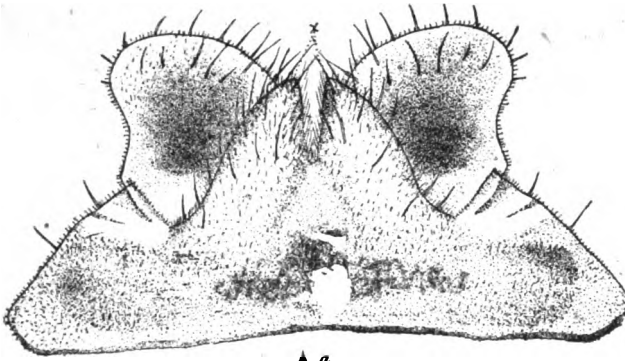
PLATE II.

- Fig. 1. Upper valves, organs of oviposition in *Tipula bicornis*.
 Fig. 2. " " " " "*Pachyrrhina* sp.
 Fig. 3. *Pachyrrhina* sp? slightly reduced.
 Fig. 4. " " body about natural size.
 Fig. 5. " " eggs, greatly enlarged, showing opposite sides.
 Fig. 6. Gall formed by *Lasioptera muhlenbergiae*.
 Fig. 1, drawn by Mr. Wright; the others by Miss Detmers.

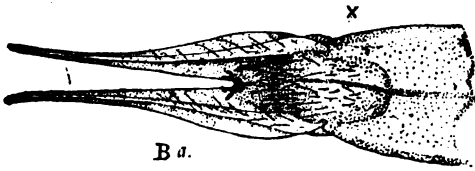
PLATE III.

- Fig. 1. Organs of aviposition of *Pachyrrhina* sp.
 Fig. 2. Lower valves and liguliform plate.
 Figs. 3-4. Deformities in straws caused by the larvæ of *Isosoma hordei*.
 Fig. 5. *Uncinula Columbiana* sp. nov.:
 a, Perithecium with appendages, top view X 75; b, same, side view, from hanging drop X 75; c, tips of appendages, strongly magnified; d, an ascus with spores X 360; e, leaf showing distribution of the perithecia, natural size.
 Fig. 1, 2, drawn by Mr. Wright; 3, 4, by Miss Vinnie Cunningham; 5, by L. G. Selby *ad noteram*.





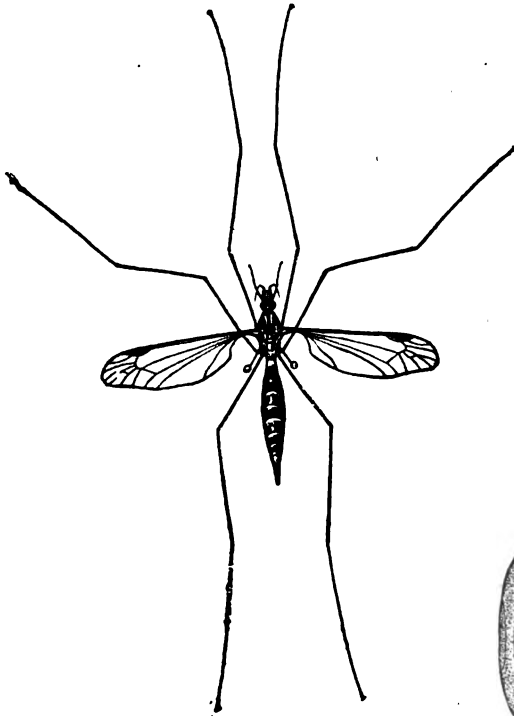
A a
1



B a.
2



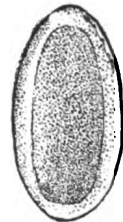
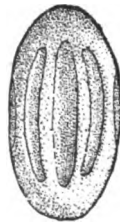
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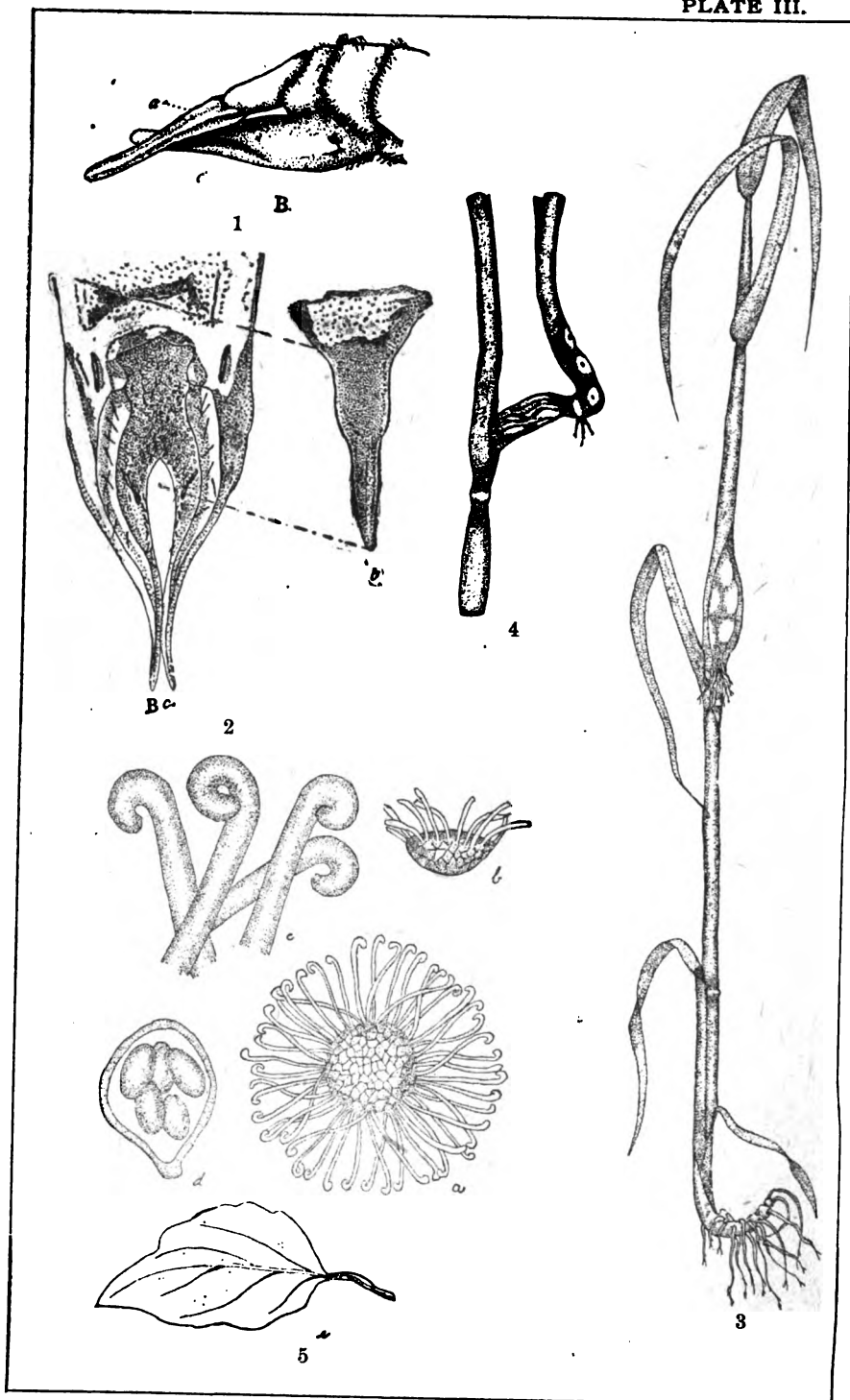
3



4



B d.
5



ARTICLE XIV—ADDITIONS TO THE PRELIMINARY LIST OF THE UREDINEÆ OF OHIO.

By FRED A. DETMERS.

In Bulletin No. 44, September, 1892, was published a preliminary list of the *Uredineæ* or so-called RUSTS of Ohio. This list, as is stated in the Bulletin, is a very short and incomplete one. Since its publication a number of additional species of *Uredineæ* have been collected in the state; the species given in the list have been found on additional hosts; and the species on the hosts already reported have been recorded for additional localities. It is therefore the purpose of this second paper to give a list of these additional species, hosts and localities.

In the first list the species were arranged alphabetically under their respective genera. In this second one I have followed the arrangement adopted by Saccardo in his *Sylloge Fungorum*, vol. VII; and whereas in the former list the nomenclature adopted by Professor T. J. Burrill in his *Parasitic Fungi of Illinois*, was followed, in the present paper Saccardo's nomenclature has been adhered to. This necessitates a partial revision of the former list, as many names have been changed, some single species have been separated into two or more; and in some cases, species formerly allowed to remain in genera as *Aecidium*, *Roestelia*, etc., which are considered incomplete, have been referred to genera having teleutosporic forms. A separate list has been made of these species in which any one of these changes was made; and the old name is printed in italics and enclosed in parenthesis to denote that it is regarded as a synonym. There are then four lists, or more correctly stated, one list divided into four sections. Section first contains the species not given in the former list, the additional species; section second, the species which have been found on hosts other than those already reported, the species on additional hosts; section third, the species which have already been reported on certain hosts from certain localities, but have been found in other, additional localities; section fourth, a list of the changes made necessary by the changes in nomenclature.

Professor W. A. Kellerman of the Ohio State University kindly placed at my disposal his collection of *Uredineæ*; the very great aid thus given me I gratefully acknowledge. I would also thank Professor A. D. Selby for the many specimens he loaned me; and Mr. W. C. Werner for aid in identifying hosts.

ADDITIONAL SPECIES.

UREDINEÆ.

Amerosporæ.

UROMYCES GERANII (DC.) Otth.

On *Geranium maculatum*, Georgesville, Franklin Co., May 7, 1892, W. A. Kellerman.

UROMYCES HYPERICI (Schw.) Curt.

On *Hypericum perforatum*, Amanda, Fairfield Co., August 30, 1892, W. A. Kellerman; on *H. mutilum*, Lancaster, Fairfield Co., Oct. 10, 1892, W. A. Kellerman.

MELAMPSORA FARINOSA (Pers.) Shroet. (*M. salicina*, Lév.)

On *Salix* sp., Columbus, Oct. 1888, C. M. Weed, Moses Craig; on *S. fragilis* var. *russeliana*, Columbus, Nov. 1, 1890, Freda Detmers.

MELAMPSORA HYDRANGÆ, Farl.

On *Hydrangea arborescens*, Sugar Grove, Fairfield Co., Sept. 26, 1891, W. A. Kellerman; Rendville, Perry Co., Oct. 24, 1891, W. A. Kellerman. This species is not given in Saccardo. The affected leaves are marked by dark brown or blackish irregular spots or areas which extend from the margin of the leaf towards the midrib. The leaf has a dried and dead appearance.

Didymosporæ.

PUCCINIA CORONATA, Corda.

On volunteer oats, Rendville, Perry Co., Oct. 24, 1892, W. A. Kellerman. Not common in the state.

PUCCINIA ARGENTATA (Schultz) Wint. (*P. nolitangeris*, Cda.)

On *Impatiens fulva*, Sugar Grove, Fairfield Co., Sept. 26, 1891, W. A. Kellerman.

The uredospores are for the most part irregularly oblong. Winter gives the measurement as varying from 15-19mm. I find spores 30.6x16mm. not uncommon. The teleutospores evidently arise from the same sori as the uredospores; for although the specimens examined are in the uredo stage, I found a single teleutospore in a uredosorus. This teleutospore measured 27x23.8mm.

PUCCINIA FUSCA, Relhan. (*P. Anemones*, Pers.)

On *Anemone nemorosa*, Georgesville, Franklin Co., May 11, 1892, Freda Detmers; Lima, May 21, 1892, W. A. Kellerman.

PUCCINIA TENUIS, Burrill. (*Aecidium tenue*, Schw).

Aecidial stage on *Eupatorium ageratoides*, Lancaster, Fairfield Co., June 28, 1883, W. A. Kellerman.

PUCCINIA FERGUSSONII, Berk. var. **HASTATÆ**. (*P. hastata*, Cooke.)

On *Viola hastata*, Lancaster, Fairfield Co., May 20, 1883, W. A. Kellerman.

PUCCINIA ANEMONES-VIRGINIANÆ, Schw.

On *Anemone Virginiana*, Lancaster, Fairfield Co., July 23, 1883, W. A. Kellerman; Scioto R., May 23, 1892, A. D. Selby.

PUCCINIA SILPHII, Schw.

On *Silphium perfoliatum*, Columbus, June 30, 1892, W. A. Kellerman.

GYMNOSPORANGIUM CLAVARIFORMÆ (Jacq.) Rees. (*Roestelia penicillata*, Fr.)

Roestelia on *Cratægus Crus-galli*, Georgesville, Franklin Co., Sept. 24, 1892, W. C. Werner, on *C. coccinea*, Ash Cave, Hocking Co., Aug. 21, 1892, W. A. Kellerman.

GYMNOSPORANGIUM GLOBOSUM, Farl.

On *Juniperus Virginiana*, Amanda, Fairfield Co., May 1892, W. A. Kellerman.

GYMNOSPORANGIUM BISEPTATUM, Ellis. (*Roestelia Amelanchieris*, Mer.)

Roestelia on *Amelanchier* sp., Mineral Springs, Adams Co., Sept. 10, 1892, W. A. Kellerman.

GYMNOSPORANGIUM CLAVIPES, Cooke et Peck. (*Roestelia aurantiaca*, Peck.)

Spermagonia only of Roestelia on *Cratægus tomentosa* var *punctata* Cedar Hill, May 10, 1892, W. A. Kellerman.

Phragmosporæ.

PHRAGMIDIUM POTENTILLÆ (Pers.) Karst.

On *Potentilla Canadensis*, Lancaster, Fairfield Co., June 20, 1879; Columbus, July 12, 1892, W. A. Kellerman.

COLEOSPORIUM SENECONIS (Pers.) Fr. (*Aecidium Pini*, Pers.)

On *Pinus rigidus*, Sugar Grove, Fairfield Co., May 21, 1891, Freda Detmers; May 30, 1892, W. A. Kellerman; Morgan Station, June 4, 1892, H. Beatty. Very abundant. At Sugar Grove the needles of the pines are covered with the aecidia.

Dictyosporæ.

RAVENELIA GLANDULIFORMIS, B. et C.

On *Tephrosia Virginiana*, Fairfield Co., June 1893, W. A. Kellerman.

UREDINEÆ INFERIORES.

AECIDIUM CIMICIFUGATUM, Schw.

On *Cimicifuga racemosa*, Ironton, May 27, 1892, W. C. Werner;
Sugar Grove, Fairfield Co., May 30, 1892, W. A. Kellerman.

The specimens of Rusts on *Cimicifuga racemosa* placed in the former list under *Ae. Actææ* should be referred to this species:

AECIDIUM DICENTRÆ, Trel.

On *Dicentra cucullaria*, Central College, Franklin Co., May 28, 1892,
W. A. Kellerman. Rare.

AECIDIUM NESÆÆ, Gerard.

On *Decodon verticillatus*, Cranberry Swamp, Licking Reservoir, June
29, 1892, A. D. Selby.

AECIDIUM SAMBUCI, Schw.

On *Sambucus Canadensis*, Central College, Franklin Co., May 28,
1892; Amanda, Fairfield Co., July 2, 1892, W. A. Kellerman.

AECIDIUM COMPOSITARUM, Mart. var. HELIANTHI, Burrill.

On *Helianthus divaricatus*, Ironton, May 27, 1892, W. C. Werner.

UREDO AGRIMONLÆ (DC.) Schroet.

On *Agrimonia Eupatoria*, Fairfield Co., Oct. 20, 1882, July 18, 1892,
W. A. Kellerman; on *Agrimonia* sp., Sugar Grove, Fairfield Co.,
Nov. 5, 1892, A. D. Selby.

UREDO HYDRANGEÆ, Berk et Curt.

On *Hydrangea arborescens*, Athens, Athens Co; Aug. 11, 1892, W.
A. Kellerman. This is very likely the uredo stage of *Melampsora*
Hydrangeæ Farl.

ADDITIONAL HOSTS.

UREDINEÆ.

Amerosporæ.

UROMYCES LESPEDENZÆ (Schw.) Peck.

On *Lespedeza polystachya*, Sugar Grove, Fairfield Co., Sept. 3, 1892, W. C. Werner; on *L. repens*, Sugar Grove, Fairfield Co., Sept. 26, 1891, W. A. Kellerman.

UROMYCES HEDYSARI-PANICULATI (Schw.) Farl.

On *Desmodium Dillenii*, Georgesville, Franklin Co., Sept. 24, 1892, W. C. Werner, Sept. 28, 1892, A. D. Selby; on *Desmodium* sp., Cedar Swamp, Champaign Co., Sept. 10, 1892, W. C. Werner; Bloomville, Hocking Co., Aug. 30, 1892, W. A. Kellerman.

UROMYCES EUPHORBIAE, Cooke et Peck.

On *Euphorbia maculata*, Akron, Sept. 4, 1892. E. W. Claypole.

UROMYCES HOWEI, Peck.

On *Asclepias* (not identified) in greenhouse. Columbus, O. S. U., Oct. 1891, W. A. Kellerman.

MELAMPSORA POPULINA, Lév.

On *Populus balsamifera* var. *candicans*, near railroad, Stockport, Morgan Co., Feb. 21, 1892, W. A. Kellerman.

Didymosporæ.

PUCCINIA MENTHÆ, Pers.

On *Pycnanthemum tinifolium*, Amanda, Fairfield Co., July 30, 1892, W. A. Kellerman.

PUCCINIA ANGUSTATA, Peck.

On *Carex riparia*, Amanda, Fairfield Co., Dec. 25, 1891, W. A. Kellerman; on *Scirpus* sp., Amanda, Fairfield Co., Dec. 25, 1891, W. A. Kellerman.

PUCCINIA ANDROPOGONIS, Schw.

On *Andropogon scoparius*, Amanda, Fairfield Co., Oct 1, 1892, W. A. Kellerman. A splendid example of irregular spores. Three celled spores are frequent, in some instances the upper cell is divided by a diagonal septum in place of a horizontal one. Four celled spores are not uncommon. The spores are often much curved.

PUCCINIA XANTHII, Schw.

On *Ambrosia trifida*, Athens, Athens Co., Aug. 11, 1892. W. A. Kellerman.

GYMNOSPORANGIUM MACROPUS, Link (*Roestelia pirata* (Schw.) Thaxter.)

Roestelia on *Pirus coronaria* Amanda, Fairfield Co., July 20, 1892, W. A. Kellerman.

ADDITIONAL LOCALITIES.

UREDINEÆ.

Amerospora.

UROMYCES POLYGONI (Pers.) Fckl.

On *Polygonum erectum*, Amesville, Athens Co., Sept. 8, 1892, A. D. Selby.

UROMYCES TRIFOLII (Hedw.) Lév.

On *Trifolium pratense*, Sugar Grove, Fairfield Co., Sept. 24, 1891, W. A. Kellerman; on old leaves of *T. pratense*, Columbus, Jan. 1892, W. A. Kellerman.

UROMYCES CALADII (Schw.) Farl.

On *Arisæma triphyllum*, Ironton, May 27, 1892, W. C. Werner; Granville, Licking Co., May 29, 1892, C. J. Herrick; on *Arisæma Dracontium*, Black Lick, Franklin Co., May 14, 1892, Ironton, May 27, 1892, W. C. Werner; Central College, Franklin Co., May 28, 1892, W. A. Kellerman.

UROMYCES LESPEDEZÆ (Schw.) Peck.

On *Lespedeza reticulata*, Otway, Scioto Co., Sept. 9, 1892, W. A. Kellerman; on *Lepedeza violacea*, Georgesville, Franklin Co., Sept. 24, 1892, A. D. Selby.

UROMYCES HEDYSARI-PANICULATI (Schw.) Farl.

On *Desmodium canescens*, Mineral Springs, Adams Co., Sept. 10, 1892, W. A. Kellerman.

UROMYCES HOWEI, Peck.

On *Asclepias Cornuti*, Athens, Athens Co., Aug. 11, 1892, W. A. Kellerman; Cedar Swamp, Champaign Co., Sept. 10, 1892, W. C. Werner; Waynesville, Warren Co., Oct. 15, 1892, W. A. Kellerman.

MELAMPSORA POPULINA (Jacq.) Lév.

On *Populus monilifera*, Scioto R., Sept. 7, 1892, A. D. Selby.

Didymosporæ.

PUCCINIA VIOLÆ (Schum.) DC.

On *Viola palmata*, Wyandotte Grove, Franklin Co., June 29, 1892,
A. D. Selby.

PUCCINIA MENTHÆ, Pers.

On *Blephilia hirsuta*, Lancaster, Fairfield Co., July 5, 1883, W. A.
Kellerman.

PUCCINIA RUBIGO-VERA (DC.) Wint.

On wheat, Lancaster, Fairfield Co., July 5, 1883, W. A. Kellerman.
Is not so common throughout the state as *P. graminis*.

PUCCINIA ANGUSTATA, Peck.

On *Scirpus fluviatilis*, Amanda, Fairfield Co., Dec. 25, 1891, W. A.
Kellerman.

PUCCINIA EMACULATA, Schw.

On *Panicum capillare*, Amanda, Fairfield Co., Dec. 29, 1891; Stock-
port, Morgan Co., Feb. 21, 1892, W. A. Kellerman.

PUCCINIA PODOPHYLLI, Schw.

On *Podophyllum peltatum*, Cincinnati, May 7, 1891, C. J. Herrick
(the specimen is from the Herbarium of Dennison University);
Lima, May 21, 1892, W. A. Kellerman; Ironton, May 27, 1892, W.
C. Werner; Central College, Franklin Co., May 28, 1892; Nebraska,
Fairfield Co., June 11, 1892, W. A. Kellerman; Wyandotte Grove,
Franklin Co., June 29, 1892, A. D. Selby.

PUCCINIA CIRCÆÆ, Pers.

On *Circæa Lutetiana*, Lancaster, Fairfield Co., June 20, 1879; Colum-
bus, June 28, 1892; Amanda, Fairfield Co., July 2, 1892; Sugar
Grove, Fairfield Co., Aug. 6, 1892; Athens, Athens Co., Aug. 11,
1892, W. A. Kellerman.

PUCCINIA XANTHII, Schw.

On *Xanthium Canadensis*, Mineral Springs, Adams Co., Sept. 10,
1892, W. A. Kellerman.

GYMNOSPORANGIUM MACROPUS, Link.

On *Juniperus Virginianum*, Amanda, Fairfield Co., May 14, 1892,
W. A. Kellerman.

UREDINEÆ INFERIORES.

AECIDIUM RANUNCULI, Schw.

On *Ranunculus abortivus*, Georgesville, Franklin Co., May 7, 1892,
W. A. Kellerman.

AECIDIUM IMPATIENTIS, Schw.

On *Impatiens* sp., Nebraska, Fairfield Co., June 11, 1892; Athens, Athens Co., Aug. 11, 1892, W. A. Kellerman.

AECIDIUM OENOTHERÆ, Peck.

On *Oenothera biennis*, Fairfield Co., May 30, 1883, May 14, 1892, W. A. Kellerman.

AECIDIUM GROSSULARIÆ, Schum.

On *Ribes Cynosbati*, Lima, Allen Co., May 21, 1892, W. A. Kellerman; Akron, June 3, 1892, W. C. Werner.

AECIDIUM COMPOSITARUM, Mart.

On *Solidago*, Lancaster, Fairfield Co., June 10, 1883, W. A. Kellerman.

AECIDIUM ERIGERONATUM, Schw.

On *Erigeron annuus*, Nebraska, June 11, 1892, W. A. Kellerman.

AECIDIUM PUSTULATUM, Curt.

On *Comandra umbellata*, Georgesville, Franklin Co., May 9, 1891, A. D. Selby; May 7, 1892, W. A. Kellerman.

**SPECIES WHICH WERE REPORTED IN THE PREVIOUS LIST, WHOSE NAMES
HAVE BEEN CHANGED.**

The names formerly used are written as synonyms; there are also given the additional hosts on which and localities in which they have been collected.

UREDINEÆ.*Amerospora.***UROMYCES TEREBINTHI** (DC.) Wint. (*Pileolaria brevipes*, Berk. et Rav.)

On *Rhus Toxicodendron*, Lancaster, Oct. 1, 1892, W. A. Kellerman.

*Didymospora.***PUCCINIA GALII** (Pers.) Schw. (*P. Galiorum*, Lk.)

On *Galium Aparine*, Georgesville, Franklin Co., Oct. 10, 1891, E. E. Bogue; on *G. concinnum*, Georgesville, Franklin Co., Sept. 24, 1892, W. C. Werner; Rendville, Perry Co., Oct. 24, 1891, W. A. Kellerman.

PUCCINIA HELIANTHI, Schw. (Included under *P. Tanacetii* in Parasitic Fungi of Ill. Burrill.)

On *Helianthus decapetalus*, Bloomville, Hocking Co., Aug. 30, 1892, W. A. Kellerman; on *H. hirsutus*, Amanda, Fairfield Co., Oct. 1, 1892, W. A. Kellerman.

PUCCINIA HIERACII (Schum.) Mart. (*P. flosculosorum*, Roehl.)

On *Taraxacum officinale*, Central College, Franklin Co., May 28, 1892, A. D. Selby.

PUCCINIA SORGHI, Schw. (*P. Maydis*, Carradorri.)

On corn leaves, Mineral Springs, Adams Co., Sept. 10, 1892; Waynesville, Warren Co., Oct. 15, 1892, W. A. Kellerman; on sorghum leaves, Laurelville, Hocking Co., Aug. 30, 1892, W. A. Kellerman.

PUCCINIA SMILACIS, Schw. (*Uredo Smilacis*, Schw.)

On *Smilax rotundifolia*, Lancaster, Fairfield Co., Oct. 20, 1882, W. A. Kellerman.

PUCCINIA SPRETA, Peck. (*P. Tiarella*, B. et. C.)

On *Mitella diphylla*, Rendville, Perry Co., Oct. 24, 1891, W. A. Kellerman.

Phragmosporæ.

PHRAGMIDIUM SUBCORTICUM (Schrank,) Wint. (*Ph. mucronatum*, Schum.) (*Coleosporium miniatum* (Pers.) Fckl.)

On *Rosa lucida*, Lancaster, Fairfield Co., June 15, 1883, W. A. Kellerman; on *Rosa* sp., Georgesville, Franklin Co. May 7, 1892, W. A. Kellerman, A. D. Selby; Ironton, Lawrence Co., May 27, 1892, W. C. Werner.

COLEOSPORIUM SONCHI (Pers.) Lév. (*Co. Compositarum* Lév.)

On *Helianthus doronocoides*, Lancaster, Fairfield Co., Sept. 26, 1882 on *Aster miser*, Lancaster, Sept. 28, 1882, W. A. Kellerman.

COLEOSPORIUM VERNONIÆ, B. et. C. Placed under *Co. Sonchi-arvensis* in previous list.

On *Vernonia* sp., Otway, Scioto Co., W. A. Kellerman.

COLEOSPORIUM SOLIDAGINIS (Schw.) Thüm. Placed under *Co. Sonchi-arvensis* in previous lists.

On *Solidago cæsia* and *S. sp.*, Sugar Grove, Fairfield Co., Sept. 26, 1891; on *S. Canadensis* and *S. latifolia*, Rendville, Perry Co., Oct. 24, 1891, W. A. Kellerman.

UREDINEÆ INFERIORES.

UREDO POLYPODII (Pers.) DC. (*U. filicum*, Desm.)

On *Cystopteris fragilis*, Lancaster, Fairfield Co., July 16, 1883, W. A. Kellerman.

UREDO (CÆOMA) NITENS, Schw. (*Cæoma nitens*, Schw.) *Cæoma luminia-tum*, Schw.)

Aecidia on *Rubus villosus*, Lancaster, Fairfield Co., June 20, 1879, May 15, June 5, 1883; Georgesville Franklin Co.; May 7, 1892, W. A. Kellerman; Sugar Grove, Fairfield Co., May 14, 1892, A. D. Selby; Black Lick, Franklin Co., May 14, 1892, E. E. Bogue; Amanda, Fairfield Co., May 14, 1892, Sugar Grove, Fairfield Co., May 30, 1892; Central College, Franklin Co.; May 28, 1892; Nebraska, June 11, 1892, W. A. Kellerman; on Raspberry, Lima, May 27, 1892, W. A. Kellerman. Aecidia and uredo stages on *Rubus villosus* (Blackberry), Sugar Grove, Fairfield Co., Sept. 26, 1891; Rendville Perry Co., Oct. 24, 1891; on Dewberry, Sugar Grove, Fairfield Co., Sept. 26, 1891, W. A. Kellerman. This rust seems to be extremely abundant throughout the state, wherever a *Rubus* grows. The uredo sori on the Blackberry and Dewberry are not fully developed, the spores are very pale, almost colorless and are still firmly attached to their pedicels. They average 17-23x14-20mm. Fully developed uredospores collected Nov. 1, 1891, on a Blackberry at Rock Mills Fairfield Co., average 22-32.6x16-22mm. These spores are bright yellow, obovate, or pear shaped, wall thin, minutely echinulate. There are no paraphyses. This may be the Uredo stage of *Puccinia Peckiana* to which *Cæoma nitens* is thought to belong. I can find no description of the uredo stage of *P. Peckiana*.

ARTICLE XV.—BIBLIOGRAPHY OF OHIO BOTANY.

BY W. A. KELLERMAN, OHIO STATE UNIVERSITY.

The list of articles here given in chronological order includes only such as refer particularly to plants that occur in Ohio.

All state and local catalogues or lists are included, also all articles dealing with native plants of Ohio—whether a single plant only or many plants are mentioned.

Purely physiological and morphological papers have been excluded. Teratological notes or papers, however, are included.

It was not the purpose to make a List of Publications by Ohio botanists, amateurs and collectors (which would, had that been undertaken,

have occupied many more pages than the present paper covers). The object was to bring together for convenient reference such and such only as referred especially to Ohio botany.

Notices of any omissions will be thankfully received.

1815.

Forest of the Miami Country, and plants useful in medicine and the arts. In Natural and Statistical View or picture of Cincinnati and the Miami Country. By Daniel Drake, Cincinnati.

A volume of 255 pages, of which pp. 76-90, inclusive, are devoted to botany. Here nothing farther was "attempted than a catalogue of the forest trees, and such herbaceous plants as are deemed useful in medicine and the arts." Under the head of "Forests of the Miami Country" is given, alphabetically arranged in three columns (the first headed "Families," the second "Species," and third "Popular Name"), a list of one hundred species belonging to about sixty genera, and several undetermined species of the genera *Prunus*, *Crataegus*, *Mespilus*, and *Smilax*. A long note is given on the species of *Aesculus*—*Ae. flava*, L. & *Ae. maxima*, n. sp.—presumably mistaken for *Ae. glabra*, Willd. & *Ae. flava*. The second sub-head is "Plants Useful in Medicine and the Arts." These are arranged alphabetically under the heads of "Stimulants" (thirteen species), "Tonics" (eight species), "Astringents" (seven species), "Emetics" (nine species), "Cathartics" (six species), "Diuretics" (three species), "Anthelmintics" (three species), "Demulcents" (two species), and "Plants used in Dyeing and the Domestic Arts" (fifteen species). The botanical name, the common name, and the part of the plant used are given in each case. The third and last section is "Calendar of Flora." "Most of the dates given are the mean terms of several years' observation." Thirty-four entries are made, beginning with March 5th, "commons becoming green," and ending with Oct. 30th, "woods leafless."

1818.

Notice of the Scenery, Geology, Mineralogy, Botany, etc., of Belmont county, Ohio, by Caleb Atwater, Esq., of Circleville. American Journal of Science (Silliman's Journal), 1818, Vol. I, p. 226.

Two pages (228-9) of this article are devoted to botany. Thirty trees are enumerated in tabular form, and a few others, including some shrubs and herbaceous plants, are noted. The uses of a few of them are given.

1831.

Notices of Western Botany and Conchology, by C. W. Short, M. D., and H. H. Eaton, A. M. Transylvania Journal of Medicine and the associated sciences. Vol. IX, 1831, p. 69.

An annotated list (pp. 70-73) of fifty species of plants noticed in bloom the preceding fall, on a trip (Sept. 16th to Oct. 1st) from Lexington, Ky., to the southern portion of Ohio (vicinity of Cincinnati). Many of the plants were found on the banks of the Ohio River.

1834.

A Catalogue of Plants growing spontaneously in Franklin Co., Central Ohio, excluding grasses, mosses, lichens, fungi, etc. By John L. Riddell, A. M. The Western Medical Gazette, Vol. II, No. 3, July, 1834, pp. 116-120.

The plants enumerated (317 species) are "arranged under the natural orders approved by Prof. Lindley." Those not native, but naturalized, are marked with a star. The habitats are given for most of the species. The plants were collected during the autumn of 1832, and the spring, summer and autumn of 1833.

1835.

Synopsis of the Flora of the Western States, by John L. Riddell. Western Journal of the Medical and Physical Sciences. Vol. VII, No. XXXI (Second Hexade, Vol. II, No. III), Jan., 1835, pp. 329-374; No. XXXII (Second Hexade, Vol. II, No. IV), April, 1835, pp. 489-556.

The region to which this synopsis or catalogue is intended to apply, "embraces Ohio, Indiana, Illinois, Kentucky, West Tennessee, and Missouri, a small part of Virginia and Pennsylvania, and of the Michigan, Northwest and Missouri territories." The plants of Ohio, unless otherwise accredited, have been personally observed and collected by the writer (John L. Riddell). "The philosophic method of Prof. Lindley is observed in the arrangement." The species are numbered serially, and include flowering plants (1-1724); equisetæ (1725-1731); ferns (1732-1769); lycopodaceæ (1770-1774); mosses (1776-1785); hepaticæ (1786-1789); characeæ (1790-1794); and lichenes (1795-1802). The list is preceded by four pages of prefatory remarks, and followed by an index to the genera, of four pages. Stations are given, and time of flowering, color of flower, height of plant, duration of existence (by signs) and the habitats.

1836.

Supplementary Catalogue of Ohio Plants, embracing the species discovered within the state of Ohio in 1835, catalogue and descriptions read and specimens exhibited before the Western Academy of Natural Sciences, March 16, 1836, by John L. Riddell, M. D. Western Journal of the Medical and Physical Sciences, Vol. IX, No. XXXVI (Second Hexade, Vol. III, No. IV), April, 1836, pp. 567-592.

The list contains 170 species, mostly flowering plants and ferns (three Lycopods, two Mosses, and one Liverwort), with localities and stations, general remarks as to size, etc., and a full description of the new species.

1840.

A Catalogue of Plants, native or naturalized, in the vicinity of Columbus, Ohio, by Wm. S. Sullivant, 1840.

A pamphlet of sixty-two pages, giving a mere list of plants which Sullivant collected in Franklin Co. He says, "The collections here listed may be taken, I think, as a tolerably fair representation of the phaenogamous flora of the central parts of this state; nearly all localities, apparently indicating a peculiar vegetation, have been visited." The list (pp. 5-55) contains 779 plants. Seven pages of notes on several species follows the list.

1841.

Florula Lancastriensis, or a Catalogue comprising nearly all the flowering and filicoid plants growing naturally within the limits of Fairfield county, with notes of such as are of medical value, by J. M. Bigelow. Proceedings of Medical Convention of Ohio at Columbus, May, 1841.

Not seen; title from Britton's State and Local Floras.

Florula Lancastriensis: A catalogue of the plants of Fairfield county, by John M. Bigelow and Asa Hor, Lancaster, 1841. A pamphlet of twenty-two pages.

Not seen; title from Britton's State and Local Floras.

1849.

Catalogue of Plants, native and naturalized, collected in the vicinity of Cincinnati, Ohio, during the years 1834-1844, by Thos. G. Lea, Philadelphia, 1849.*

The list is preceded by a "notice" (p. ii.) by Isaac Lea (brother of Thos. G. Lea), who states that the MS. and herbarium were placed in the hands of W. S. Sullivant, who determined the phenogams, mosses and hepaticæ. Edw. Tuckerman identified the lichens, and M. J. Berkley the fungi. Notes and descriptions by the latter are given as foot-notes. The arrangement is according to the natural system. There are enumerated about 698 species of phenogams, nineteen ferns, two equisetaceæ, eighty-nine musci, sixty-eight lichens (of which four were new to science) and about 320 fungi (of which about fifty were new), making in all nearly 1,050 species.

*We are indebted for summary of contents to Mr. Davis L. James, to whom we extend thanks for this and other favors.

List of the medicinal plants of Ohio, with brief account of their properties, by John M. Bigelow, M. D., Columbus, Ohio, 1849.

Pamphlet of forty-seven pages. Not seen; given in Britton's State and Local Floras. Torrey Bulletin; X. 104.

1852.

Catalogue of Flowering Plants and Ferns observed in the vicinity of Cincinnati, by Joseph Clark. Adopted and published by the Western Academy of Natural Sciences, Cincinnati, 1852.

Pamphlet of thirty pages. The list—preceded only by a list of the officers and curators of the academy, there being no preface—embraces the plants "observed growing in a compass of about six miles around Cincinnati." In a foot-note the author says, "Some of them cannot be found in the circuit * * * * but they were all found as above indicated, within the last fifteen years," The genera of the flowering plants and ferns (*Chara flexilis* also included) are arranged alphabetically, and the orders are not indicated. No varieties as such are recognized. Six hundred and one species are given, and in an Addenda, by Robert Buchanan, ninety-five more are given, or a total of 696 species.

1853.

The Grasses of Wisconsin and the adjacent States of Iowa, Illinois, Indiana, Ohio and Michigan, and the territory of Minnesota and the region about Lake Superior, by I. A. Lampham. Trans. Wis. State, Agr. Soc. III, 397-488, 1853.

Not seen; title from Britton's Local Floras of the United States.

1858.

List of the Grasses found in Ohio, by John H. Klippart. Twelfth Annual Report of the Ohio State Board of Agriculture, 1859. Columbus, 1858, p. 37.

This compiled list includes both the native and cultivated grasses, and gives, in tabular form, the scientific name, common name, place where found, condition (wild or cultivated), and flowering time. It covers three pages, and enumerates 105 species.

1859.

Catalogue of the Flowering Plants and Ferns of Ohio, by J. S. Newberry, M. D. Ohio Agricultural Report for 1859, pp. 135-273.

This is "the first effort toward the formation of a complete flora of the state." The list of plants is preceded by a general discussion of the "influences which have determined the distribution of species" over the state, pp. 235-241; and a list of the sources from which the catalogue was compiled, as follows: Catalogue of the plants of Franklin county, by W. Sullivan; catalogue of the plants of Fairfield county, by Drs. Bigelow and Hor; catalogue of the plants of Cincinnati, by Thos. G. Lea; catalogue of the plants of Cincinnati, by Joseph Clark; synopsis of the flora of the Western States, by J. L. Riddell; MS. catalogue of plants in Summit and Cuyahoga counties, by the author.

Localities, as "general," "western," "southern," etc., are given for all species or particular localities for rarer plants. The catalogue includes 1341 species and varieties of flowering plants, and fifty-three vascular cryptogams, or a total of 1394. At this place should, perhaps, be noted the statement of J. H. Klippart, prefixed to the Beardslee Catalogue, which was published in the Ohio Agricultural Report for 1877, to the effect that he, in conjunction with a few others, collected plants and obtained local lists by others, and by this means prepared a catalogue of plants of Ohio, which was submitted to Dr. Newberry for suggestion and correction, and that the latter returned for publication not the original manuscript, but that published whose title is given above.

1860.

List of the Native Forest Trees of Ohio. By John A. Klippart. Ohio Agricultural Report, 1860, pp. 277-8.

This list is appended to Mr. Klippart's article on "Forests, their influence upon Soil and climate", covers two pages, enumerating in tabular form one hundred and seven trees (including both species and varieties, also a few of the larger shrubs) gives the botanical names, the popular names, height in feet, and where (in the State) most abundant.

1865.

Catalogue of Plants Contained in Herbarium of Joseph Clark. By Rachel L. Bodley. Not published. Cincinnati, 1865.

In this printed pamphlet the Cincinnati plants are starred, and number six hundred and seventeen phenogams, and twenty-three ferns.

1872.

List of Trees Found Growing Indigenously in Ohio. By John Hussey. Twenty-seventh Annual Report of the Ohio State Board of Agriculture for 1872. Columbus 1873, pp. 32-40.

The list contains both the trees and shrubs, of which two hundred and twenty-seven are enumerated. Localities are given for many of the species, and in several cases notes are added.

1874.

Catalogue of the Plants of Ohio including Flowering Plants, Ferns, Mosses, and Liverworts. By H. C. Beardslee. Painesville, Ohio, January, 1874. Pamphlet of nineteen pages. Reprinted in Ohio Agricultural Report, 1877, pp. 346-363.

Dr. Beardslee prepared in the fall of 1873 a catalogue of Ohio plants for publication in the Geological Survey of the State. This list is a condensation of that catalogue, giving "merely a list of genera and species with localities." He reports, including both species and varieties, one thousand one hundred and seventeen Exogens, four hundred and twenty-nine Endogens, and three hundred and eighty-two Acrogens: total one thousand, nine hundred and twenty-eight. Or rearranging the summary, there are one thousand five hundred and forty-six phenogams, seventy-one vascular cryptogams, two hundred and sixty-one mosses, and fifty hepaticæ.

Report on the Geology of Delaware County. By N. H. Winchell. Report of the Geological Survey of Ohio, 1874. Vol. I, Part I. Geology, p. 272. (Trees, etc., p. 274.)

Of this report two pages (pp. 274-5) are devoted to a list of "Trees, Shrubs, and hardy vines found growing in Delaware County" furnished by Rev. J. H. Creighton. It is a list comprising the scientific names of one hundred and twenty-two species.

Report on the Geological Survey of Ohio, 1874. Vol. I, p. 415 (Trees p. 416.)

A list of twenty-nine trees which are "characteristic of the county" is given, both the scientific and common names being used.

The Geology of Defiance County. By N. H. Winchell. In report of the Geological Survey of Ohio, 1874, Vol. I, p. 422 (Trees p. 424.)

"In the survey of the county, the following species of trees were noted" namely a list (including scientific and common names) of forty-three species.

1875.

Note from Painesville, Ohio. By H. C. Beardslee. Bulletin of the Torrey Botanical Club. Vol. VI. No. 2, 1875, p. 16.

Notices viviparous species of *Scirpus*, and occurrence of *Fissidens hyalinus*, *Amarantus Blitum*, and *Hydrodictyon utriculatum*.

1876.

Some interesting Cryptogams found near Painesville (H. C. Beardslee) Botanical Bulletin (Gazette), Vol. I, No. 3. January, 1876, p. 12.

Discelium nudum found in 1872; *Fissidens hyalinus*, 1873; *Riccia Frostii* in 1874.

List of Hepaticæ growing in Ohio. Dr. H. C. Beardslee, Painesville, Ohio. Botanical Bulletin (Gazette) Vol. 1. No. 6, April, 1876, p. 22.

A list, without stations, of sixty species and varieties.

Forest Trees of the United States, Centennial Collection (Vasey.) Ohio Trees (Klippart), Ohio Agricultural Report, 1876. 354-388.

This is a reprint of a Report by Dr. Vasey to the Commissioner of Agriculture, and Mr. J. H. Klippart added the word "Ohio" to such as occur in this state.

A peculiar form of Ragweed, *Ambrosia artemisiaefolia*. By Joseph F. James; Botanical Gazette. Vol. 1, No. 2. Dec. 1876, p. 63.

Specimens found at Loveland, Ohio, with no sterile flowers, but fertile flowers in upright spikes.

1877.

Wolffia (mode of reproduction.) By H. C. Beardslee. Botanical Gazette, Vol. 1, No. 6, April, 1877, p. 99.

Indentation and finally fission of the frond.

Camptosorus rhizophyllus (Miss H. J. Biddlecome), Botanical Gazette, Vol. 1, No. 6, April, 1877, p. 100.

Prolongation of basal lobe five inches, in two cases the apex had taken root.

Some Hardy *Dentarias*. By Joseph F. James. Botanical Gazette. Volume. 1, No. 8, June, 1877, p. 115.

Some specimens of *Dentaria laciniata* not injured by frost.

Some *Nymphæas*. By H. C. Beardslee. Botanical Gazette, Vol. II, No. 12. October, 1877, p. 144.

Nelumbium luteum at Bass Lake. *Nymphæa* with pink flowers.

1878.

Flora of the Miami Valley. By A. P. Morgan. Published by the Literary Union, Dayton, Ohio, 1878.

A pamphlet of sixty-eight pages including the Phenogams, Ferns, Mosses, Liverworts, Lichens, and Fungi of Miami, Montgomery, Butler, Warren, and Hamilton Counties.

Botrychium lunarioides var. *obliquum*. By Mrs. E. J. Spence. Botanical Gazette, Vol. III. No. 4. April, 1878, p. 39.

Specimen with two disconnected, well-developed spikes.

Report of the Geology of Darke County. By A. C. Lindemuth. Second Report of the Geological Survey of Ohio. Vol. III, part I. Geology, 1878, p. 496.

The "most common forest trees noticed" are given (thirty-two in number) both by popular and botanical name (on pp. 511-2).

1879.

Catalogue of the Flowering Plants, Ferns, and Fungi growing in the Vicinity of Cincinnati. By Joseph F. James. Journal of the Cincinnati Society of Natural History, April, 1879; also separate pp. 1-27.

The author compiled the work from personal observation, and from the catalogues of Messrs. Lea and Clark. Assistance from others is also acknowledged. The list of fungi were "copied bodily from the excellent catalogue of Mr. Lea published in 1849," and a few collected since added. The corrections in nomenclature and orthography were made by Prof. Charles H. Peck. Eight hundred and ninety phenogams and vascular cryptogams (including also *Chara flexilis*) and three hundred and nineteen fungi are given, or a total of one thousand two hundred and eighteen species and varieties.

Agaricus Morgani Peck. By A. P. Morgan. Botanical Gazette. Vol. IV, No. 9. Sept. 1879, p. 208.

Notes extremely large specimen, largest in the world; mentions color of spores, green.

Notes from Toledo, Ohio. By J. A. Sanford. Botanical Gazette, Vol. IV, No. 10. October, 1879, p. 219.

Mentions *Schollera*, *Solidago*, *Liatris*, *Amarantus*, *Zizania*, *Cornus*, and *Lactuca*.

1880.

Draba verna, L. and *Sisymbrium Thaliana*, Gaud. biennial. By H. C. Beardslee. Bulletin of the Torrey Botanical Club, Vol. VII, No. 2. February, 1880, p. 43.

Notices of rosettes of radical leaves of three species, Feb. 18, which were found in the previous fall.

Notes from Painesville (H. C. Beardslee). Botanical Gazette, Vol. V, No. 4. April, 1880, p. 43.

Mentions viviparous specimens of *Scirpus* and *Cenchrus* and biennial habit of *Draba* and *Sisymbrium*.

Teratologay; *Carya alba*. By H. C. Beardslee. Bulletin of the Torrey Botanical Club, Vol. VII, No. 5. May, 1880, p. 54.

Notices occurrence of triangular nuts of *Carya alba* (apparently *C. sulcata*).

New Stations for rare Plants. By A. P. Morgan. Botanical Gazette, Vol. VII, No. 7. July 1880, p. 79.

Notes occurrence of *Botrychium matricariæfolium* at Columbus and *Veratrum Woodii* at Dayton.

1881.

Notices of the Floras of Cincinnati, published from 1815 to 1879 with some additions and corrections to the catalogue of Joseph F. James. By Davis L. James. In the Journal of the Cincinnati Society of Natural History, January, 1881.

The additions and corrections are numbered to correspond to the numbers in Joseph F. James' Catalogue and consist of ninety-three entries.

Nymphæa odorata. By Davis L. James. Botanical Gazette, Vol. VI, No. 9. Sept. 1881, p. 266.

Notes structure of seeds (aril) to secure dispersion of seeds as noticed by Dr. John A. Warder and son at North Bend, Ohio.

Notes from Dayton. By August F. Fœrste. Botanical Gazette, Vol. VI, No. 10. Oct. 1881, p. 274 and Vol. VII, No. 2, Feb. 1882, p. 24.

Gives arrangement of leaves in *Conobea multifida* and *Nesæa verticillata*; mentions forked pinnæ in *Dicksonia* and notes occurrence of *Lycoperdon pedicellatum* at Dayton.

1882.

Woody Plants of Ohio, arranged under their appropriate Botanical orders with remarks upon their uses, qualities and sources. By Jno. A. Warder, M. D., President American Forestry Association, assisted by Davis L. James and Jos. F. James, of the Cincinnati Society of Natural History. Presented at the meeting of the Agricultural Convention of Ohio, in Columbus, January, 1882.

Pamphlet, pp. 1-40. Brief address to the convention referring to prevailing ignorance as to our native forest trees, explanation of the paper (pp. 2-3), explanatory note to the reader (pp. 3-4), "note" by D. L. J. and J. F. J. p. 4, and Woody Plants of Ohio, pp. 5-40. Native species printed in blackfaced type of which two hundred and sixty-one are enumerated. One hundred and thirty-seven introduced species are mentioned accompanied usually, as are the native species, with brief descriptive notes, printed in small capitals, if foreign plants, and in italics if introduced from other portions of the United States. The paper is mostly a record of Dr. Warder's own observations, though many localities are given on the authority of Beardslee and Newberry.

Teratological Note. By A. F. Færste. Botanical Gazette, Vol. VII. No. 11. Nos. 8 and 9, Aug. and Sept. 1882, p. 112.

Multiplication of parts in *Lathyrus palustris* at Dayton.

A New Polyporus. By A. P. Morgan. Botanical Gazette, Vol. VII, No. 11. Nov. 1882, p. 135.

Describes *Polyporus reniformis*, Morgan, occurring from Dayton to Cincinnati.

Lactuca Scariola, L. By Aug. F. Færste. Botanical Gazette, Vol. VII, No. 11. Nov. 1882, p. 137.

Abundant at Dayton, Put-in-Bay etc.; places its vertical leaves so as to point to the poles.

1883.

Mycologic Flora of Miami Valley, by A. P. Morgan, in the Journal of the Cincinnati Society of Natural History, Apr. 1883, Jan. 1888, Vol. VI-XI. Nine numbers as follows: April, July, Oct. (1883), Apr. (1884) July, Oct. (1885), Apr. (1887), Jan. (1888). July, Oct. (1888).

It includes full and original descriptions of Hymenomycetes of all the species found, some of which are new and many are illustrated by colored plates.

Large *Rhus Toxicodendron*, by Aug. F. Foerste, Botanical Gazette, Vol. VII, No. 6, June, 1883, p. 245.

Specimen at Dayton seventeen inches in circumference.

Chorisis in *Podophyllum*, by Aug. F. Foerste, Botanical Gazette, Vol. VIII, No. 7, July, 1883, p. 259.

Notes on *Dedoublement* in specimen of *Podophyllum* at Dayton.

New species of North American Fungi, by J. B. Ellis and W. A. Kellerman in American Naturalist, Nov., 1883, pp. 1164-1166.

Fourteen species are enumerated and described of which ten were collected in Ohio, (the remaining in Kansas).

1884.

Report on weeds (by W. S. Devol) second report of the Ohio Agr. Experiment Station for 1883, Columbus, 1884, p. 187.

Notices number of weeds in the state, means of destruction and commonest ones in different sections of the state. A part of the same article is also reported under "Report of Committee on Botany" in the proceedings of Columbus Horticultural Society, Dec. 4, 1884.

Abnormal *Trillium*, by Jos. F. James. Botanical Gazette, Vol. IX, No. 7, July, 1884, p. 113.

Four-parted *Trillium erectum*, whorl of three leaves and small leaf on peduncle.

Contributions to the Flora of Cincinnati, by Jos. F. James, in the Journal of the Cincinnati Society of Natural History, July, 1884.

The article covers fourteen pages and gives the results of observations of the plants of the vicinity of Cincinnati, which have been accumulating the past two years. Besides critical notes on the species, new localities are given for many plants and a few, not before reported for that region, are given.

1885.

Descriptive notes of some of the newer and least known weeds of the State (W. R. Lazenby) in the Third Annual Report of the Ohio Agr. Experiment Station for 1884, Columbus, 1885, p. 164.

Twelve species are described from notes "from the answers received from the circulars and from observations made by the Station."

Abnormal *Trillium*, and Violet with Runners, by Jos. F. James. Bulletin of Torrey Botanical Club, Vol. X, No. 5, May, 1885, p. 57.

Two notes as to, (1) *Trillium sessile* with parts mostly in fives and (2) runners, twelve to eighteen inches long of *Viola striata*.

1886.

Report on Forestry (by W. R. Lazenby), in Fourth Annual Report of the Ohio Agr. Experiment Station for 1885, Columbus, 1886, pp. 242.

The report covers two pages (242-3) and contains, (1) a "list of the principal timber trees of Ohio," fifty-one species, both common and scientific names are used; (2) a tabulation of "comparative growth and hardiness of forest tree seedlings," sixteen species.

Report on Weeds (by W. S. Devol), in Fourth Annual Report of the Ohio Agr. Experiment Station for 1885, Columbus, 1886, p. 193.

This report covers fourteen pages and includes "weeds on different soils" (pp 193); "general remarks" (p. 194); "descriptive notes of five species" (pp.194-196); "prolificacy of weeds" (pp.196-198, essentially the same also in the Journal of the Columbus Horticultural Society, Vol. III, No. 3, March, 1888, pp. 38-43); and a "List of the Plants of Ohio (229 species) which generally appear as weeds" (pp. 198-206).

The Flora of Ross County, Ohio, Compared with that of New England, by W. E. Safford. Bulletin of the Torrey Botanical Club, Vol XIII, No. 7, July, 1886.

Notices a large number of conspicuous plants, many of which do not reach New England.

Natural History of the Grape, by W. R. Lazenby, in Proceedings of the Columbus Horticultural Society, Columbus, Sept. 25, 1886, pp. 4.

A general account of the family and gives four species growing wild in Ohio; *Vitis Librusca*, *V. æstivalis*, *V. riparia*, and *V. cordifolia*.

Notes on some Introduced Plants chiefly in Summit county, Ohio, by E. W. Claypoole, in Bulletin of the Torrey Botanical Club, Vol. XIII, No. 10, Oct., 1886, p. 187.

A record of some introduced plants; ten species of which are well established and six represented by a single specimen of each.

1887.

Report on Weeds (by W.S.Devol) in the Fifth Annual Report of the Ohio Agr. Experiment Station for 1886, Columbus, 1887, p. 230.

Sixteen species are named which "have been discovered in the State since the publication of Dr. Beardslee's Catalogue of Plants of Ohio,"

(pp. 230) (The same list is printed in the Journal of the Columbus Horticultural Society, Vol. III, No. 1, Jan., 1888, p. 47). This list is followed by a "list of plants identified" (pp. 231-3).

Botanical Notes (by W. R. Lazenby) in the Fifth Annual Report of the Ohio Agr. Experiment Station for 1886, Columbus, 1887, pp. 304.

A few short notes are given (p. 304) followed by a list (pp. 305-7) of seventy-four species with their dates of blooming in the years 1882-7.

Notes on *Sanguinaria Canadensis* by Aug. F. Foerste, in the Bulletin of the Torrey Botanical Club, Vol. XIX, No. 4, April, 1887, p. 74.

An article two pages in length and one plate giving the morphology of the plant; locality, Dayton.

List of Algae, by H. L. Jones, in bulletin of the Scientific Laboratories of Dennison University, May, 1887, Vol. II, pp. 115-6.

A list of thirty-four species, mostly Desmids, found in the Licking Reservoir and the ponds about Granville, Ohio.

Botanical Notes (*Liquidambar* in Ohio) by Jos. F. James. Bulletin Torrey Botanical Club, Vol. XIV, No. 10, Oct. 4, 1887, p. 223.

Notes occurrence of *Liquidambar* near Oxford and the vicinity of Cincinnati.

Plants in Bloom in September, October and November, (observed by Moses Craig and reported by W. S. Devol) Journal of the Columbus Horticultural Society, Vol. II, Nos. 10, 11, 12, Oct., Nov., Dec., 1887, pp. 166, 189, 207.

The lists number eighty-eight, fifty-eight and six species respectively.

Note on the color of *Caulophyllum thalictroides*, by K. B. Claypole. Bulletin of the Torrey Botanical Club, Vol. XIV, No. 12, Dec. 3 1887, p. 258.

Notices the less dark color of this species in Ohio than in Canada.

1888.

Botanical Notes (by W. R. Lazenby) in Sixth Annual Report of the Ohio Agr. Experiment Station for 1887, Columbus, 1888, p. 286.

This article consists of "plants named" pp. 286-8. Date of blooming of plants for 1882-7, a list of 317 species (pp. 289-298).

List of Diatoms from Granville, Ohio, by J. L. Deming, in Bulletin of the Scientific Laboratories of Dennison University, April, 1888, Vol. III, pp. 114-5.

A list of twenty-four species preceded by a general account of Diatoms.

Arbor Day Number, Journal of the Columbus Horticultural Society, Vol. III, No. 5, May, 1888.

Devoted to an account of Arbor Day exercises at the Ohio State University to which is appended a list of "Native Trees of Ohio."

List of Algae from Granville, Ohio, by Chas. L. Payne, in Bulletin of Dennison University, Dec. 1888, Vol. IV, Part I, p. 132.

Sixteen species are enumerated as an additional list to that published in 1887 by H. L. Jones. One *Spirogyra* "appears to be undescribed."

1889.

Preliminary List of the Flowering and Fern Plants of Lorain Co., Ohio, compiled by Albert A. Wright, professor of Geology and Natural History in Oberlin College, Oberlin, Ohio, 1889.

A pamphlet of thirty pages, containing a map of Lorain Co., a preface (pp. 3-5), list of botanical books (p. 5, eight entries) and list of plants (pp. 7-30). The plants introduced from other countries are printed in italics. The list was "made principally by putting together the observations of the compiler and a few friends who have made recent collections in this county * * * also the collection of the late Dr. Jas. Dascomb * * * the species ascribed to this county by Dr. Kellogg in Dr. Newberry's catalogue and those reported by Dr. H. L. Howard * * * in Beardslee's yet unpublished catalogue * * * have all been noted." There are 887 species enumerated.

Report of the Committee on Botany, by Aug. D. Selby, Journal of the Columbus Horticultural Society, Vol. IX, No. 2, June, 1889, p. 35.

Notices the number of plants in bloom in March and gives a list of sixteen species.

Report of the Committee on Botany, by Aug. D. Selby, Columbus Horticultural Society, Vol. IV, No. 4, Dec. 1889, p. 107.

Notices rarity or profusion of blossoms according to deficiency or abundance of moisture and occurrence of new and rare plants to the county.

1890.

A Catalogue of the Uncultivated Flowering Plants growing on the Ohio State University grounds, by Moses Craig, in the Bulletin of the Ohio Agr. Experiment Station, Technical Series, Vol. I, No. 2, May, 1890, pp. 49-110.

The catalogue proper is preceded by an Introduction, Limits of the flora and its physical characters, Geology of the farm, Notes on the climate, Extent and beauty of our flora, Time of blooming of plants, maps, classification, statistics of the catalogue, etc., pp. 49-61. The number of species and varieties enumerated is 468. In nearly every case they are accompanied by full notes as to occurrence, abundance, etc.

A preliminary List of the Plants of Franklin county, Ohio, prepared for the Columbus Horticultural Society by Aug. D. Selby and Moses Craig, M. S. Committee on Botany for 1890:

A pamphlet of nineteen pages, three of which (3-5) contain the Introduction, twelve (7-18) include the neatly printed list—the genera in black-faced type arranged alphabetically under the orders, and the species alphabetically arranged under the genera—and the last page (19) gives a summary of added and introduced plants. The list contains 1,002 plants, being an addition of 223 to Sullivan's Catalogue published fifty years before.

Mycologic Observations, I. (January 1890), by A. P. Morgan, Botanical Gazette, Vol. XV, No. 4, April, 1890, p. 34.

Notices many fungi to be seen in Winter, as *Agaricus Sepridas*, *Tremellas*, *Schizophyllum*, *Menispora*, *Aithrosporum*, *Bactridium*, *Naematelia*, *Stereum*, *Dacrymyces*.

Supplementary List to the Plants of Ohio preliminary to a complete catalogue of the flora of the State, by William R. Lazénby and W. C. Werner. Department of Botany and Horticulture, Ohio State University, Columbus, Ohio, 1890.

Native species are printed in heavy faced type, those introduced in small capitals. "The total number of plants, including both species and varieties, enumerated in this list, is one hundred twenty three. Of this number sixteen are cryptogams. Deducting these there are one hundred thirteen indigenous and sixty-four introduced Phaenogams."

Plants blooming in February and March, by Aug. D. Selby, Journal of the Columbus Horticultural Society, Vol. V. No. 2, June, 1890, p. 24.

Gives date of blooming of twenty-four species.

The Snowy Trillium (*T. nivale*, Riddell), By Aug. D. Selby, Journal of the Columbus Horticultural Society, Vol. V, No. 2, June, 1890, p. 36.

Gives a general description, its distribution and a full page plate.

Prickly Lettuce—An Introduced Weed, By Miss Freda Detmers, Journal of the Columbus Horticultural Society, Vol. V, No. 3, September, 1890, p. 53.

Gives a general description of the plant, illustrated by a plate showing inflorescence and leaves, natural size.

Wild Carrot (*Daucus Carota*, L.), by Aug. D. Selby, *Journal of the Columbus Horticultural Society*, Vol. V. No. 3, September, 1890, p. 70.

Gives a general description and notices its distribution and means of eradication.

The Lakeside Daisy, by Clarence M. Weed, *Journal of the Columbus Horticultural Society*, Vol. V. No. 3, September, 1890, p. 72.

Describes and notices occurrences of *Actinella acaulis* in the limestone plains of the Sandusky Peninsula. (The plant found was *Actinella scaposa*, var. *glabra*, and not *A. acaulis*.)

Report of committee on botany, by Aug. D. Selby, *Journal of the Columbus Horticultural Society*, Vol. V, No. 4, December, 1890, p. 85.

Mentions results of collecting during the year and the new finds at Sellsville, near Columbus.

1891.

Notes from Columbus, Ohio, by Aug. D. Selby, *Botanical Gazette* XVI, No. 5, May, 1891, p. 148.

Notes occurrence of *Bidens connata* with upwardly barbed awns and gives list of introduced plants on circus grounds of Sells' Brothers near Columbus, Ohio.

Our Native Oaks, by Aug. D. Selby, *Journal of the Columbus Horticultural Society*, Vol. VI, No. 2, June, 1891, p. 41.

Gives a general account of the oaks and recommends for cultivation for ornamental purposes especially the Pin Oak, also; Yellow, Scarlet and Laurel Oaks.

The Fungous Diseases of Lettuce, by Miss Freda Detmers, *Journal of the Columbus Horticultural Society*, Vol. VI, No. 2, June, 1891, p. 47.

Notifies and describes *Septoria Lactucae*, *Septoria consimilis* and *Peronospora gangliiformis*.

Botany—May, (under Communications and Discussions), by Aug. D. Selby, *Journal of the Columbus Horticultural Society*, Vol. VI, No. 2, June, 1891, p. 63.

Notifies the collecting of several rare plants near Columbus.

Some Troublesome Weeds and the Ohio Statutes Relating to Weedy Plants, by Aug. D. Selby, *Journal of the Columbus Horticultural Society*, Vol. VI, No. 3, September, 1891, p. 96.

Mentions characteristics of a weed and gives the six worst weeds for Franklin county (Wild Carrot, Canada Thistle, Wheat Thief, Moth Mullein, Toad Flax, Ribgrass, and Narrow Dock) and Ohio laws relating to Weeds.

Plants Introduced at Sellsville, near Columbus, Ohio, by W. R. Lazenby. Bulletin of the Torrey Botanical Club, Vol. XVIII, No. 10. Oct. 1891, p. 801.

Gives a list of eighteen plants occurring in the place used by Sells' Brothers as the winter quarters for their circus and menagerie, seven of which occur elsewhere in the state.

List of plants observed growing wild in the vicinity of Cincinnati, Ohio, by C. G. Lloyd, Cincinnati, Ohio, Oct. 1891.

A pamphlet of eight pages giving list of six hundred seventeen species of phenogams and vascular cryptogams.

Diseases of the Raspberry and Blackberry, by Miss Freda Detmers In Bulletin of the Ohio Agricultural Experiment Station Second Series. Vol. IV, No. 6, Oct. 1891, p. 124.

A general account of four parasitic fungi infesting the raspberry and blackberry, namely *Gloeosporium venetum*, *Septoria Rubi*, *Caeoma nitens*, and Blight of Raspberry.

Report of the Committee on Botany, by Aug. D. Selby, Journal of the Columbus Horticultural Society, Vol. VI, No. 4, December, 1891, p. 111.

Mentions activity in collecting plants last year and gives over fifty "Additions to Preliminary List of the plants of Franklin county, Ohio."

Plum Pockets (*Exoascus Pruni*, Fckl.), By Miss Freda Detmers. Journal of the Columbus Horticultural Society, Vol. VI, No. 4, December, 1891, p. 113.

Notices occurrence of *Exoascus Pruni* in the upper portions of *Prunus Americana* and on the same both of *Monilia fructigenum*, Pass. and *Phyllosticta prunicola*, Sacc.

Apple Scab (*Fusicladium dentriticum*), by Miss Freda Detmers, in Bulletin of the Ohio Agricultural Experiment Station, Sec. Ser. Vol. IV, No. 9, Dec. 1891, p. 187.

An account covering three pages, including general remarks, external characters and effect on host, and "microscopical characters."

1892.

On the Occurrence of Certain Western Plants at Columbus, Ohio, by Aug. Selby. Proceedings of the Indiana Academy of Science, 1891, Terre Haute, 1892, p. 74.

Mentions the blending in central Ohio of eastern and western species of plants and notices presence of "distinctly western and southwestern plants, introduced by wholesale, as it were," giving twenty such species as found on Sells Brothers' circus grounds at Columbus.

Variations and Intermediate Forms of Certain Asters, by W. C. Werner. Journal of the Cincinnati Society of Natural History, Vol. IV. No. 1, April, 1892, p. 55.

The variations of the species noticed in northern and Central Ohio are *Aster Shortii*, *A. undulatus*; *A. cordifolius*; *A. sagittifolius*; *A. Lindleyanus*.

A Fungous Enemy of Plant Lice (*Empusa Aphidis*), by Miss Freda Detmers. Journal of the Columbus Horticultural Society, Vol. VII, No. 1, March, 1892, p. 121.

Notices occurrence of *Empusa Aphidis* in greenhouse on various species of plant lice, as *Phorodon mahaleb*, *Aphis mali*, *Aphis* on *chrysanthemum*.

Some Fungous Pests of Greenhouse Plants, by W. A. Kellerman. Journal of the Columbus Horticultural Society, Vol. VII, No. 1, March, 1892, p. 20.

Describes two fungous diseases, carnation rust, (*Uromyces carophyllinus* [Schrank] Schroet.) and "damping off;" specimens of the former exhibited now occurring in Ohio.

Catalogue of the Phanerogams and Ferns of Licking County, Ohio, by Herbert L. Jones, in Bulletin of the Scientific Laboratories of Denison University, Vol. VII, pp. 4-103, March, 1892.

On pages 4 to 11 inclusive are given the Introduction, Herbaria, Geology of Licking county, Altitude of different points, rainfall, temperature, etc., a list of the worst weeds, times of flowering, trees, locations of special botanical interest, forms of certain species, nomenclature and map. The list of species (pp. 11-101) is accompanied with notes as to localities and dates, etc. The total number of species and varieties enumerated is 945. On page 102 are given a summary of species under distribution as to soil and comparison with other Ohio floras; on p. 103, errata. A map of the county accompanies the catalogue.

On the Flora of Northern Ohio, by Edo Claassen, in American Journal of Pharmacy, March and April, 1892.

This article covers nine pages and describes the explorations of the author made on the Lake Erie shore and islands. Rarer plants, peculiar to many different localities, are named, and finally a more extended list (of several hundred species) of plants more widely distributed concludes the paper.

Two New Genera of Hyphomycetes, by A. P. Morgan. Botanical Gazette, XVII, No. 6, June 1892, p. 190.

Descriptions are given of *Cylindroctadium scoparium*, Morgan, and *Synthetospora electa*, Morgan.

Forest Trees of Ohio for the World's Columbian Exposition (By W. A. Kellerman). Bulletin No. 5, Ohio World's Fair Commission, Columbus, (1892); also (in part) in First Quarterly Report of the Executive Commissioner for Ohio.

Contains a list of eighty-eight species, giving both botanical and common names; also a list of twenty-three species doubtfully classed as trees, five doubtfully occurring in Ohio.

Reports of Standing Committees: Botany; May. By Aug. D. Selby. Journal of the Columbus Horticultural Society, Vol. VII, No. 2, July, 1892,, p. 67.

Notices plants near Central College, allied to Appalachian Flora.

Reports of Standing Committees: Vegetable Pathology; May. By W. A. Kellerman. Journal of the Columbus Horticultural Society, Vol. VII, No. 2, July, 1892, p. 70.

Notices abundance of peach curl, black knot, and bramble rust; mentions weeds as harboring some fungi which are destructive to crops, hence the necessity of destroying them.

Field Experiments with Wheat, by J. Freemont Hickman, in the Bulletin of the Ohio Agricultural Experiment Station, Sec. Ser, Vol. V, No. 5, Aug. 1892, p. 83.

Under the sub-head of Scab and Smut (p. 93) note is made of prevalence of scab, loose smut and stinking smut or "bunt" on wheat.

Botanical papers at the A. A. A. S.; note on Yellow Pitch Pine, by W. A. Kellerman, Botanical Gazette, XVII, No. 9, Sept., 1892, p. 280.

Notices occurrence of a new variety of *Pinus rigida*, *P. rigida*, var. *lutea*, Kellerman, in Fairfield county, Ohio.

A Preliminary List of the Rusts of Ohio, by Miss Freda Detmers, in the Bulletin of the Ohio Agricultural Experiment Station, Sec. Ser Vol. V, No. 7, Sept. 1892, p. 133.

In the list (pp. 133-140) of sixty-eight species are given the name of the rust, the name of the plant on which it is found, the locality in, and the time at which it has been collected, together with occasional notes.

Description of a New Phalloid, by A. P. Morgan, in the Journal of the Cincinnati Society of Natural History, Oct., 1892.

A new genus and species (*Phallogaster saccatus* Morgan) found in Hamilton county (Morgan) Licking county (C. J. Herrick) also in New York and Connecticut are described and illustrated by a lithographic plate.

The Wild Plants of Northeastern Ohio; Preliminary List of the Wild Plants of Ashtabula county, by Sara F. Goodrich. Western Reserve School Journal, Geneva, Ohio, Nov., 1892, and Jan., 1893.

A preface precedes the list; the latter gives the scientific and common names of the plants.

New Plants for the Flora of Ohio, by W. C. Werner. Read before the Ohio State Academy of Science, Dec. 29, 1892. *

Notes the occurrence of *Fossombronina cristata*, *Thuya occidentalis* (apparently mistaken by early Ohio collectors for *Chamæcyparis thyoides*), *Monarda clinopodia*, *Oxalis recurva*, *Lobelia puberula*, *Centaurea jacea*, *Cyperus sylvaticus*, *Eleocharis quadrangulata*, *Bignonia capreolata*, and *Opuntia Rafinesquii*.

Ohio Erysipheæ, by Aug. D. Selby. Read before the Ohio State Academy of Science, Dec. 29, 1892. *

Includes a general account of the group and a list of Ohio species with hosts, stations, dates, and collectors, and notes on many of the species.

A Few Rare Ohio Plants, by Aug. D. Selby. Read before the Ohio State Academy of Science, Dec. 29, 1891. *

Notes the occurrence of *Erysimum aspernum* and *Gonolobus obliquus* at Columbus; and *Silene rotundifolia* at Ash Cave, Hocking county.

New and Rare Plants for the flora of Ohio, by W. A. Kellerman. Read before the Ohio State Academy of Science, Dec. 30, 1892. *

Notices occurrence of one specimen of *Ilex opaca*, apparently native in Lawrence county; the occurrence of one specimen of Lea's oak, at Brownsville, Licking county; and *Polypodium incanum*, at Mineral Springs, Adams county; and an unsuccessful search for *Magnolia tripetala*, in Lawrence county.

* Published in this Bulletin.

Corrections and Additions to Moses Craig's Catalogue of the uncultivated flowering plants growing on the Ohio State University grounds, by W. A. Kellerman and Wm. C. Werner. Read before the Ohio State Academy of Science, Dec. 30, 1892. *

Gives a large number of corrected identifications and many additional species for the area covered.

Notes on the Distribution of Some Rare Plants in Ohio, by Wm. C. Werner. Read before the Ohio State Academy of Science, Dec. 30, 1892.*

The following are some of the plants: *Sullivantia Ohionis*, *Iris cristata*, *Sabbatia angularis*, *Draba verna*, *Juncus Canadensis*—with known extended range indicated.

The Uredineæ of Ohio, by Miss Freda Detmers. Read before the Ohio State Academy of Science, Dec. 30, 1892. *

Gives a general account of the life history of the species of the group and an annotated list of the unreported Ohio species.

The Lichens of Ohio, by E. E. Bogue. Read before the Ohio State Academy of Sciences, Dec. 30, 1892.

1893.

Additions to the Preliminary List of the Flowering and Fern Plants of Lorain County, Ohio, compiled by Albert A. Wright, Oberlin, Ohio, 1893. Laboratory Bulletin, No. 1, Supplement.

A pamphlet of eleven pages, giving a list of 106 additions, all the species being "authenticated by specimens now in the college herbarium."

The Myxomycetes of the Ohio Valley, Ohio, by A. P. Morgan. First paper (read Jan. 3, 1893), Journal of the Cincinnati Society of Natural History, Jan., 1893.

Gives a general description of the group, followed by descriptions of the species. Twenty-four species (five of them new) belonging to seven genera are described, accompanied by a plate of twelve figures.

ARTICLE XVI.—EXPERIMENTS IN GERMINATION OF TREATED SEED.

BY W. A. KELLERMAN, OHIO STATE UNIVERSITY.

The treatment of seed wheat and seed oats to prevent smut is now more generally practiced than heretofore. Well known and efficient

* Published in this number of the Bulletin.

fungicides are solutions of copper sulphate, potassium sulphide (Liver of Sulphur), and water raised to a temperature of 132—140° F.

In testing and using the latter the writer and his assistant in the Kansas Experiment Station noticed that the treated seed invariably germinated more quickly than similar but untreated seed. (II. An. Rep. Kans. Exp. Sta.) The yield from the treated seed was also much greater—greater too than would be accounted for by the fact of replacing the usually smutted portion with sound grain.

The more rapid and better germination of treated seed was also noticed by Prilleaux, by Jensen, and later by J. C. Arthur. It was also noticed by the latter (See Bull. No. 35, Ind. Exp. Sta.) that not only at the time of treatment, but also after an interval of time had elapsed after the treatment of the seed with water at 132—135° F. the more rapid germination of the seed was yet noticeable.

Subsequently Dr. Arthur's germination experiments showed that this quicker germination of the treated seed was less marked the longer the interval after the treatment. The experiments detailed in tabular form below were instituted with a view of further testing this point.

It might be stated here that an explanation has lately been offered by Dr. Arthur for the more rapid germination of the seed treated with hot water. He claims that an enzyme or ferment is developed by heating the seed in water of a temperature of about 90° F., and this he thinks accounts for the more rapid germination.

The following tests were begun in July 1891 and repeated at subsequent intervals of 5½, 13½, and 17½ months. Corn, oats and wheat were used.

The number of grains of each kind in each test varied from one hundred to five hundred seeds. The several lots of seed were treated with the following fungicides: (1) Water at 132° F., immersion 15 minutes; (2) Potassium Sulphide (Liver of Sulphur) ½ % solution, immersion eight hours, and (3) a similar solution, immersion twenty-four hours. Rain water at ordinary summer temperature was used for the solutions. Untreated seed was also used in case of each test, for comparison.

Wooden trays were used partially filled with sand and placed in the greenhouse. The seeds were placed on the surface of the moistened sand and at once dampened with an atomizer. They were protected from too rapid evaporation by a plate of glass. At the end of each period of twenty-four hours the atomizer was again used.

The following tables show the result :

TABLE SHOWING GERMINATION OF CORN AT INTERVALS AFTER TREATMENT.

When tested	Mode of treatment of seed.	Percentage germination.			
		1st day.	2d day.	3d day.	8th day.
At time of treatment.....	UNTREATED.....	0	12	35	100
"	Water 132° F.; immersion 15 min....	0	23	53	100
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	0	36	70	100
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.....	42	85	97	100
5½ months after treatment..	UNTREATED.....	0	1	29	99
"	Water 132° F.; immersion 15 min....	0	5	37	99
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	0	0	14	97
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.....	0	0	1	75
13¼ months after treatment..	UNTREATED.....	0	70	97	97
"	Water 132° F.; immersion 15 min....	0	38	98	99
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	0	33	92	97
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.....	0	2	15	66
17½ months after treatment.	UNTREATED.....	0	0	13	97
"	Water 132° F.; immersion 15 min....	0	0	27½	100
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	.....	.....	.....	.....
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.....	0	0	0	35

It is seen from the above table that the quickest germination, when tested at time of, or rather immediately after treatment, was that of the seed soaked in potassic sulphide twenty-four hours. But the time of putting the seed in the solution should be taken as the starting point in this case: that is, the "1st day" in the table should be counted as the second and the "2d day" as the third; then the comparison with the other percentages can be properly made.

The first test showed most favorably for the sulphide treatment twenty-four hours. The sulphide treatment for eight hours stood next, and the hot water treatment third. The untreated seed was the slowest to germinate.

In the second, third and fourth tests the most favorable results are shown by the seed of the hot-water treatment. Those with the potassic sulphide treatments fall below the untreated seed.

The seed treated twenty-four hours with the potassic sulphide, though germinating well at the time of treatment, was evidently injured for late germinations. The deterioration continued cumulatively to the last test where the result is very marked — no germination at all the third day and only 35 % at the eighth day.

TABLE SHOWING GERMINATION OF OATS AT INTERVALS AFTER TREATMENT.

When tested.	Mode of treatment of seed.	Percentage Germination.			
		1st day.	2d day.	3d day.	8th day.
At time of treatment.....	<i>UNTREATED</i>	0	32	81	99
"	Water 132° F.; immersion 15 min....	0	59	76	97
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	0	59	81	91
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.....	10	58	74	75
5½ months after treatment...	<i>UNTREATED</i>	0	51	87	99
"	Water 132° F.; immersion 15 min....	1	68	93	99
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	0	78	93	98
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.	0	72	83	87
13½ months after treatment.	<i>UNTREATED</i>	1	60	79	85
"	Water 132° F.; immersion 15 min....	0	56	77	85
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	0	37	52	70
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.....	0	25	33	56
17½ months after treatment.	<i>UNTREATED</i>	0	6	27	35
"	Water 132° F.; immersion 15 min....	0	1½	27½	53
"	Potas. Sulphide $\frac{1}{2}$ % sol. 8 hours.....	0	0½	10	33
"	Potas. Sulphide $\frac{1}{2}$ % sol. 24 hours.....	0	1	10	29

The test with oats, like that with corn, shows a quicker germination immediately after treatment, for the twenty-four hour potassium sulphide treatment. This of course would not be unexpected. The showing, however, is not so favorable if we count as the beginning of germination the time of immersion in the solution, *i. e.*, count the "1st day" in the table as the second day, and the "second day" as the third.

The tests at intervals show oftenest the most favorable results for the hot-water treatment.

They also show that the twenty-four hour immersion in potassic sulphide solution was detrimental to the germination.

The germination at the end of the second interval was not so good as before and at the end of the last interval it shows marked deterioration—the greatest with the potassium sulphide treatment.

TABLE SHOWING GERMINATION OF WHEAT AT INTERVALS AFTER TREATMENT.

When tested.	Mode of treatment of seed.	Percentage Germination.			
		1st day.	2d day.	2d day.	8th day.
5½ months after treatment.	UNTREATED.....	34	93	98	99
"	Water 132° F.; immersion 15 min....	10	59	79	97
"	Potas. Sulphide ½ % sol. 8 hours.....	36	86	91	93
"	Potas. Sulphide ½ % sol. 24 hours.....	30	89	93	95
13½ months after treatment.	UNTREATED.....	45	83	86	87
"	Water 132° F.; immersion 15 min....	5	67	78	89
"	Potas. Sulphide ½ % sol. 8 hours.....	49	72	76	76
"	Potas. Sulphide ½ % sol. 24 hours.....	32	60	63	65
17½ months after treatment.	UNTREATED.....	0	41	61	69
"	Water 132° F.; immersion 15 min....	0	23½	47	57
"	Potas. Sulphide ½ % sol. 8 hours.....	0	36½	51	54
"	Potas. Sulphide ½ % sol. 24 hours.....	0	36	50	58

The above table of results is not so satisfactory as the preceding, since unaccountable irregularities occur throughout.

The most favorable results are those of the potassium sulphide treatment except those after the longer intervals, when a decline in germinating power is noticeable.

GENERAL CONCLUSIONS.

The treatment of seed with either of the two smut fungicides—Hot-water (132° F., 15 minutes,) and Potassium Sulphide (½ % solution) — is to be recommended for hastening the germination of the smut spores and to induce the plant to pass as quickly as possible the period of greatest vulnerability to smut infection, namely, the earliest stage of the seedling when it is extremely delicate.

The treated seed generally shows a better germination than untreated seed. The germination at the end of a few months is scarcely as favorable, and after a long interval it is plainly inferior.

Whether the explanation of better germination of treated seed is to be sought for in some, possible change in the testa or seed coats, or portions exterior to the embryo, perhaps rendering them better moisture-absorbing agents, is not known. The explanation referred to above, namely, the development of an enzyme by gentle heat, though it may account for the better germination in case of the seed treated with hot water, evidently would be no explanation for the improved germination of the seed treated with potassium sulphide; since in the latter case no heat was applied and water of ordinary summer temperature of rain water stored in a cistern was used.

ARTICLE XVII—ANALYTICAL SYNOPSIS OF THE GROUPS OF FUNGI.

BY W. A. KELLERMAN AND AUG. D. SELBY.

In Saccardo's *Sylloge Fungorum* there is given a comprehensive system of classification which, whatever may be said of its defects, is better than no system, and its use will doubtless become general. It seems therefore appropriate that an introductory key to the several groups should be prepared for the use of beginners.

An artificial key according to the dichotomal method—being simple and easily mastered by beginners and amateurs—may serve for first introduction, though upon slight acquaintance with the principal groups the analytical synopsis will be preferred.

We have therefore prepared the two keys—the first as simple as possible (though we hope reasonable accuracy has not been sacrificed)—the second being essentially a translation of Saccardo's *Conspectus systematicus generalis* (in *Sylloge Fungorum*, Vol. VIII, p. XIII). The volume and page where each family may be found in the *Sylloge* are also given.

It is hoped that this essay may be of some service in furthering the rapidly increasing interest in mycological studies—nowhere more marked than in connection with the Experiment Stations, particularly in reference to those fungi of economic interest.

ARTIFICIAL KEY.

1. Plants usually large (the so-called "higher fungi") at least the fruiting body large, the vegetative stage less conspicuous or not evident; asci never present (2).
1. Plants usually small or microscopic; asci present or absent (8).
 2. Hymenium, i. e. spore-bearing layer, external (*Hymenomycetes*) (3.)
 2. Hymenium, i. e. spore-bearing layer, internal (*Gasteromycetes*.) (6).
3. Hymenium in the form of lamellæ, tubes, pores or spines (4).
3. Hymenium not as above, smooth (5).
 4. Hymenium in the form of lamellæI. Agaricaceæ
 4. Hymenium in the form of tubes or poresII. Polyporaceæ
 4. Hymenium in the form of soft spinesIII. Hydnaceæ
5. Fungi more or less coriaceousIV. Thelephoraceæ
5. Fungi more or less fleshyV. Clavariaceæ
5. Fungi gelatinousVI. Tremellaceæ

6. Fungi terrestrial, i. e. not underground (7).
6. Fungi subterraneanX. Hymenogastraceæ
7. Bursting from a volva (sac), deliquescentVII. Phallaceæ
7. Somewhat cup-shaped, coriaceousVIII. Nidulariaceæ
7. Sub-membranaceous, pulverulent within.....IX. Lycoperdaceæ
 8. Asci absent (9).
 8. Asci present (*Ascomycetes*) (26).
9. Vegetative stage of free protoplasm, i. e. plasmodium present (*Myxomycetes*) (10).
9. Vegetative stage not as above, no plasmodium (11).
 10. Spore receptacles (*peridia*) none; zoospores present.....XLIX. Monadinaceæ
 10. Peridia slightly developed, capitate, clavate; no zoospores.....L. Sorophoraceæ
 10. Peridia perfect; zoospores present.....LI. Myxomycetaceæ
11. Well developed perithecia [*pycnidia*] present (*Sphærospideæ*) (12).
11. Perithecia absent (13).
 12. Perithecia ostiolate or astomous, black.....LII. Sphærioidaceæ
 12. Perithecia ostiolate, bright colored.....LIII. Nectrioidaceæ
 12. Perithecia subdimidiate, black.....LIV. Leptostromaceæ
 12. Perithecia scutellate, patelliform or excipuliform.....L V. Excipulaceæ
13. Mycelium none or not distinct (14).
13. Mycelium distinct or present (17).
 14. Zoospores absent (15).
 14. Zoospores present (16).
15. Multiplication gemmiparous and ascogenous.....XLVII. Saccharomycetaceæ
15. Multiplication mostly by fission, no asci present.....XLVIII. Schizomycetaceæ
 - 16 Zoospores fully formed, distinctly ciliate.....XVII. Chytridiaceæ
 16. Zoospores indistinctly formed, scarcely ciliate.....XVIII. Protomycetaceæ
17. Zoospores or zygospores present (18).
17. Zoospores and zygospores absent (22).
 18. Mycelium distinct (19).
 18. Mycelium obsolete (21).
19. Phytoparasitic, zygospores immersed, conidia superficial.....XIII. Peronosporaceæ
19. Zoo-parasitic, aerophilous, mostly zygosporiferous.....XIV. Entomophthoraceæ
19. Saprogenous, zoosporiferous or zygosporiferous (20).
 20. Hydrophilous, zoosporiferous.....XV. Saprolegniaceæ
 20. Aerophilous, zygosporiferous.....XVI. Mucoraceæ
21. Perfectly formed zoospores, evidently ciliate.....XVII. Chytridiaceæ

- 21. Zoospores indistinct, not plainly ciliate.....XVIII. Protomycetaceæ
 - 22. Imperfect fungi, i. e. complete life-history not known, conidiiferous (23).
 - 22. Life history known (smuts and rusts), not bearing conidia (25).
- 23. Fungi innate in the matrix.....LVI. Melanconiaceæ
- 23. Fungi sub-superficial (24).
 - 24. Pallid or bright-colored, lax, collapsing.....LVII. Mucedinaceæ
 - 24. Fuscous or blackish, lax, rigid.....LVIII. Dematiaceæ
 - 24. Pallid or fuscous, united into a stipe.....LIX. Stilbaceæ
 - 24. Pallid or fuscous, united into a wart-like acervulus.....LX. Tuberculariaceæ
- 25. Not pulverulent, spores pedicelled, fungi often polymorphic.....XI. Uredinaceæ
- 25. Black powdery when mature (*smuts*), spores not pedicelled.....XII. Ustilaginaceæ
 - 26. Fungi terrestrial, i. e. not underground (27).
 - 26. Fungi subterranean (35).
- 27. On animals or animal matter, spore-receptacle subglobose.....XLI. Onygenaceæ
- 27. Entomogenous, spore-receptacle very small, stipitate.....XLII. Laboulbeniaceæ
- 27. Not as above; growing on plants or vegetable matter (28).
 - 28. Spore-receptacle monascous, immersed in a tuberculiform stroma.....XL. Phymatosphæriaceæ
 - 28. Spore-receptacle polyascous, closed or ostiolate (*Pyrenomyces*) (29).
 - 28. Spore-receptacle polyascous, open disc-like or cup-like (*Discomyces*) (38).
- 29. Perithecia dimidiate (30).
- 29. Perithecia not as above (31).
 - 30. Perithecia perforate or astomous.....XXIV. Microthyriaceæ
 - 30. Perithecia rimosely dehiscent.....XXVII. Hemihysteriaceæ
- 31. Perithecia perfect (32).
- 31. Perithecia (*loculi*) immersed in, not separable from, the stroma.....XXIII. Dothideaceæ
 - 32. Perithecia ostiolate (33).
 - 32. Perithecia astomous.....XIX. Perisporiaceæ
- 33. Perithecia dehiscent by a longitudinal fissure.....XXVI. Hysteriaceæ
- 33. Perithecia not as above (34).
 - 34. Ostiolum punctiform, perithecia black.....XX. Sphæriaceæ
 - 34. Ostiolum punctiform, perithecia bright colored.....XXII. Hypocreaceæ
 - 34. Ostiolum infundibuliform, perithecia black.....XXI. Coryneliaceæ
 - 34. Ostiolum compressed.....XXV. Lophostomaceæ

35. Sporidia at length dissolving into powder (36).
 35. Sporidia not dissolving into powder (37).
 36. Capillitium present.....XLIII. Elaphomycetaceæ
 36. Capillitium absent..... XLIV. Cenococcaceæ
 37. Gleba venose, lacunose or cavernose.....XLV. Tuberaceæ
 37. Gleba evenose, solid.....XLVI. Endogonaceæ
 38. Ascomata (spore-receptacle) with no true excipulum, asci naked
 XXXVIII. Gymnoascaceæ
 38. Ascomata acrogenous on branching stipes.....
 XXXVII. Cordieritaceæ
 38. Not as above (39).
 39. Ascomata immersed (40).
 39. Ascomata superficial (41).
 40. Ascomata bright colored.....XXXIV. Stictaceæ
 40. Ascomata black.....XXXV. Phacidiaceæ
 41. Fungi biogenous, ascomata globose or ovoid.....XXVIII. Cyttariaceæ
 41. Not as above (42).
 42. Ascomata turbinate, pyriform or globose, very small stipitate,
 fibrose or subcorneous.....XXXIX. Caliciaceæ
 42. Ascomata clavate, mitrate, capitate and stipitate, carnose or
 ceraceous XXIX. Helvellaceæ
 42. Ascomata turbinate or cupulate, gelatinous.....
 XXXIII. Bulgariaceæ
 42. Not turbinate nor gelatinous, or not as above (43).
 43. Ascomata carnose or ceraceous (44).
 43. Ascomata coriaceous or corneous (45).
 44. Asci not erumpent; fungi rarely fimicolous.....XXX. Pezizaceæ
 44. Asci erumpent; fungi mostly fimicolous.....XXXI. Ascobolaceæ
 45. Ascomata sessile or stipitate, often furfuraceous externally.....
 XXXII. Dermateaceæ
 45. Ascomata sessile, minute, not furfuraceous.....XXXVI. Patellariaceæ

SYNOPSIS.

Series I. Fungi exclusive of the "form genera."

A. PLASMODIUM ABSENT.

B. MYCELIUM DISTINCT, OR RARELY OBSOLETE.

C. ASCI ABSENT.

D. RECEPTACLE (FRUITING BODY) DISTINCT.

E. HYMENIUM EXTERNAL (HYMENOMYCETES).

I. Agaricaceæ (S. Vol. V, p. 3); Hymenium lamellate.

II. Polyporaceæ (S. VI. 1); Hymenium tubulose or porose.

III. Hydniaceæ (S. VI. 429); Hymenium aculeate.

IV. Thelephoraceæ (S. VI. 513); Hymenium smooth; fungi subcoriaceous.

V. Clavariaceæ (S. VI. 690); Hymenium smooth; fungi subcarnose.

VI. Tremellaceæ (S. VI. 760); Hymenium smooth; fungi gelatinous.

E. HYMENIUM INTERNAL (GASTEROMYCETES).

VII. Phallaceæ (S. VII. 1); Fungi epigeous, with a volva, deliquescent.

VIII. Nidulariaceæ (S. VII. 28); Fungi epigeous, coriaceous, subcyathiform.

IX. Lycoperdaceæ (S. VII. 48); Fungi epigeous, submembranaceous, utriculate, pulverulent within.

X. Hymenogastraceæ (S. VII. 154); Fungi hypogeous, subcarnose, never pulverulent.

D. RECEPTACLE (FRUITING BODY) WANTING OR OBSOLETE.

F. *Mycelium distinct.*

G. *Zygosporcs and zoosporcs wanting.*

XI. Uredinaceæ (S. VII. 528); Parasitic, scarcely pulverulent, spores stipitate; fungi often polymorphic, i. e. two or more stages in the life cycle.

XII. Ustilaginaceæ (S. VII. 449); Parasitic, mostly pulverulent, conglobulate, spores sessile, not polymorphic, rarely conidiiferous.

G. *Zoosporcs or zygosporcs present.*

H. *Phytoparasitic.*

XIII. Peronosporaceæ (S. VII. 233); zygosporcs immersed in the matrix conidia superficial.

H. *Zooparasitic.*

XIV. Entomophthoraceæ (S. VII. 280); Aerophilous, zygosporiferous (rarely azygosporiferous).

H. *Saprogenous.*

XV. Saprolegniaceæ (S. VII. 264); Hydrophilous, zoosporiferous.

XVI. Mucoraceæ (S. VII. 181); Aerophilous, zygosporiferous.

F. *Mycelium obsolete.*

XVII. Chytridiaceæ (S. VII. 319); Zoosporcs formed by division of the protoplasm, distinctly ciliate.

XVIII. Protomycetaceæ (S. VII. 286); Zoosporcs indistinct, mycelium scarcely manifest.

C. ASCI PRESENT.

K. Fungi epigeous.

L. *Spore-receptacles 'perithecia' closed or ostiolate, polysporous (Pyrenomycetes).*

XIX. Perisporiaceæ (S. I. 1); Perithecia astomous, usually black.

XX. Sphacriaceæ (S. I. 88); Perithecia punctiform-ostiolate, black.

- XXI. Coryneliaceæ (S. IX. 1073); Perithecia infundibuliform-ostiolate, black.
- XXII. Hypocreaceæ (S. II. 447); Perithecia punctiform-ostiolate, bright colored.
- XXIII. Dothideaceæ (S. II. 588); Perithecia (loculi) immersed in and scarcely separable from the stroma.
- XXIV. Microthyriaceæ (S. II. 650); Perithecia dimidiate, scutellate, pierced or astomous.
- XXV. Lophiostomaceæ (S. II. 672); Perithecia compressed ostiolate.
- XXVI. Hysteriaceæ (S. II. 721); Perithecia opening by a longitudinal fissure.
- XXVII. Hemihysteriaceæ (S. IX. 1094); Perithecia dimidiate, rimosely dehiscent.

L. Spore-receptacles (ascomata) mostly open-discoid, polyascous (Discomycetes).

- XXVIII. Cyttariaceæ (S. VIII. 4); Ascomata subglobose peripherally pluriloculate, superficial.
- XXIX. Helvellaceæ (S. VIII. 7); Ascomata clavate, mitrate, capitate, stipitate, superficial.
- XXX. Pezizaceæ (S. VIII. 53); Ascomata cupulate or flat, carnose or ceraceous; asci not erumpent.
- XXXI. Ascobolaceæ (S. VIII. 512); Ascomata cupulate or flat, carnose, superficial; asci erumpent.
- XXXII. Dermateaceæ (S. VIII. 545); Ascomata cupulate or flat, suberose-coriaceous, erumpent, superficial.
- XXXIII. Bulgariaceæ (S. VIII. 607); Ascomata turbinate or cupulate, gelatinous, superficial.
- XXXIV. Stictaceæ (S. VIII. 647); Ascomata immersed, bright-colored, ceraceous.
- XXXV. Phacidiaceæ (S. VIII. 705); Ascomata immersed, black, ceraceous.
- XXXVI. Patellariaceæ (S. VIII. 768); Ascomata superficial, black, subcorneous.
- XXXVII. Cordieritaceæ (S. VIII. 810); Ascomata acrogenous on branches.
- XXXVIII. Gymnoascaceæ (S. VIII. 811); Ascomata spurious; asci naked, superficial.
- XXXIX. Caliciaceæ (S. VIII. 825); Ascomata turbinate, often black, fibro-corneous.

L. Spore-receptacles (locelli) closed, monascous.

- XL. Phymatosphæriaceæ (S. VIII. 843); Locelli immersed in a very small tuberculiform stroma.

L. Spore-receptacles subglobose; fungi epizöic.

XL I. Onygenaceæ (S. VIII. 861); Ascomata membranaceous, fragile, often stipitate.

L. Spore-receptacles (perithecia ?) conical, very small, fungi parasitic (entomogenous).

XL II. Laboulbeniaceæ (S. VIII. 909); Perithecia conical, ovoid or cylindrical.

K. Fungi hypogeous.

XL III. Elaphomycetaceæ (S. VIII. 863); Gleba at length pulverulent, capillitium present.

XL IV. Cenococcaceæ (S. VIII. 871); Gleba at length pulverulent, capillitium absent.

XL V. Tuberaceæ (S. VIII. 872); Gleba venose or lacunose, never pulverulent.

XL VI. Endogonaceæ (S. VIII. 905); Gleba solid, never pulverulent.

B. MYCELIUM NONE OR NOT DISTINCT.

XL VII. Saccharomycetaceæ (S. VIII. 916); Multiplication gemmiparous and ascogenous; fungi zymogenous.

XL VIII. Schizomycetaceæ (S. VIII. 923); Multiplication scissiparous and endogenous; fungi patho-chromo-zymogenous.

A. PLASMODIUM PRESENT [THE VEGETATIVE STAGE].

XL IX. Monadinaceæ (S. VII. 453) Spore-receptacles (peridia) wanting; zoospores present.

L. Sorophoraceæ (S. VII. 450); Spore-receptacles (peridia) not perfect, capitate, clavate, small, zoospores none.

LI. Myxomycetaceæ (S. VII. 323); Spore-receptacles (peridia) perfect; zoospores present.

Series II. Imperfect Fungi (Stages only in the cycle of development.)

M. Perithecium (pycnidium) present (Sphaeropsidaceæ)

LII. Sphærioidaceæ (S. III. 1); Perithecia perforate or astomous, black.

LIII. Nectrioidaceæ (S. III. 613); Perithecia perforate, bright colored.

LIV. Leptostromaceæ (S. III. 625); Perithecia subdimidiate, ostiolate, rimosely deliscent or astomous, black.

LV. Excipulaceæ (S. III. 664); Perithecia scutellate, patellate or excipuliform.

M. Perithecium (pycnidium) absent; fungi innate in the matrix.

LVI. Melanconiaceæ (S. III. 696).

M. Perithecium (pycnidium) none; fungi sub-superficial (Hyphomycetes).

- LVII. Mucedinaceæ (S. IV. 2); Pallid or bright colored, lax, collapsing.
 LVIII. Dematiaceæ (S. IV. 235); Fuscous or black, lax but rather rigid.
 LIX. Stilbaceæ (S. IV. 563); Pallid or fuscous, in a stipe-like fascicle.
 LX. Tuberculaceæ (S. IV. 635); Pallid or fuscous, in a verruciform acervulus (*sporodochium*).

ARTICLE XVIII.—THE OHIO ERYSIPIHÆ.

BY AUG. D. SELBY.

It has been the aim in the following pages to give briefly the characters of the Erysipheæ, and to present a list of those species which have so far been found in the state. In the characterization of the family only so much is noted as may serve to distinguish it from others, and form the basis for intelligent effort in the application of remedies.

The material upon which the list is based was obtained from several sources; but as yet no systematic collection of the fungi of the whole state has ever been undertaken. Prof. W. A. Kellerman has kindly given access to material of all the Ohio species in his herbarium, and to a large number of specimens collected by him in 1892. Miss Freda Detmers likewise permitted me to use a large number from her herbarium. These included collections by Miss Detmers, Dr. C. M. Weed and by others connected with the Experiment Station, made chiefly in 1888, 1889 and 1890. Collections made the past season by Mr. W. C. Werner, Mr. E. E. Bogue and the writer, were also examined. Specimens were contributed by Mr. H. L. Jones and Miss Sara F. Goodrich. Obligations to the above named persons and to others, whose names appear in connection with the enumeration of specimens, are gratefully acknowledged.

The account given of the species is very brief where specific characters are mentioned at all. One species of *Uncinula* appears to be new to science, and is so described. The student is referred to the few books named below. These are the most available and useful:—North American Pyrenomycetes, by J. B. Ellis and B. M. Everhart, 1892—Erysipheæ, by Prof. T. J. Burrill; Parasitic Fungi of Illinois, Part II, Erysipheæ, by T. J. Burrill and F. S. Earle [Bulletin Illinois State Laboratory of Natural History, Vol. II, Article VI]; the Erysipheæ in Winter's "Die Pilze," Band I, II Abth., and in Saccardo's *Sylloge Fungorum* Vol. I.

Illustrations of the genera are given in Burrill and Earle's Erysipheæ of Illinois, and in Winter. These are helpful to the beginner.

In the limitation of species and in nomenclature Prof. Burrill's last account of the group has been followed. The synonymy may be found in his works.

For the study of amateurs, the Erysipheæ possess some marked advantages. They are everywhere present in greater or less abundance, and, unlike so many of the fungi, have both the conidial and complete stages upon the same host. For ordinary purposes of determination the characters are sufficiently evident and do not require high powers of magnification. The variation in form and structure is yet enough to attract the amateur microscopist who seeks something worthy of his effort. It may also be added that the latest and best descriptions of American species are those of Prof. Burrill, in the works cited.

Many imperfections and omissions must exist in this first enumeration of the Ohio mildews. Contributions of specimens are solicited, that a more complete account may be possible.

ERYSIPHÆ, Léveillé.

The Erysipheæ, powdery mildews or leaf mildews, as they are sometimes called, are easily recognized by the white web-like or dusty coating they form upon a large number of common plants. Being most frequent upon the leaves of the host, they are therefore spoken of as "leaf mildews," although found upon stem and fruit likewise. These mildews appear to develop in late summer or fall, when the white covering upon the parts affected cannot fail to be observed.

In many cases the growth of the fungus begins earlier in the season, but attention is rarely called to it until a large part of the leaf, stem or fruit becomes involved.

The growth in question consists of web-like branching threads, *hyphæ*, attached at intervals, by means of special branches called haustoria, to the surface of the part or leaf over which it spreads. This ramification of threads mutually crossing and recrossing, and all the time growing very close to the surface of the leaf, is the *mycelium* or vegetative portion of the fungus. The mycelium is usually abundant in this group, but sometimes sparse; the hyphæ composing it are very numerous, slender, branched, septate, white or colorless. The *haustoria* occur at intervals, and penetrate only the epidermal cells of the host, serving for attachment and probably for nourishment.

As the development of the mycelium advances, erect branches are formed, similar to the others but destined for reproduction. At the tips of these upright branches or fertile hyphæ are found the non-sexual spores or *conidia*, placed one above another like the links of a chain. The presence of an immense number of these conidia gives to the fungus-covered surface its dust-like appearance. They are single-celled oval bodies, sometimes forming series of several spores, and are very easily detached. Their office is to propagate the fungus during the period favorable to its growth, but they are not able to withstand the severities of winter. Being light, the conidia are readily transported by the wind.

In later summer and fall a number of small, dark or black spherical bodies are seen scattered over the mildewed leaf. These are the *perithecia* or fruiting bodies; within each matured perithecium one or more sacs or *asci* occur. Each ascus contains from two to eight *spores*, known as sexual spores, or asco-spores; they are here called *spores*. It is by means of these sexual spores that the parasite can survive the winter and the death of its host. They are analogous to the seeds of higher plants, and will grow after a longer or shorter period of rest.

The formation of the perithecium and the sexual pores contained in it, has been carefully studied by De Bary. For a full statement the reader is referred to his "Morphology and Biology of the Fungi, Mycetoza and

Bacteria," pp. 201-3, or the same author's *Beiträge zu Morphologic and Physiologie der Pilze*, III. Summarized, the process is as follows:—At the point of contact of two crossing hyphæ, each sends out a sort of special branch. The one from the lower thread gives rise to the *carpogonium*, homologous with the pistil of flowering plants. The other produces the *antheridium*, homologous with the stamens (anthers) of the flower. The former is fertilized by the latter, usually in later summer; the carpogonium then develops into the perithecium. At first colorless, this soon becomes yellowish, then finally dark or black. The perithecia are commonly globular in form, and are visible without a magnifying glass.

The wall of the perithecium varies in texture. Its cellular structure is evident from the reticulations upon its surface. There are no openings in the wall; the asci and spores escape only by the rupture or decay of the wall itself.

The *appendages*, as they are called, are slender, hair-like, outgrowths from the wall of the perithecium. These assume various forms, characteristic of the different genera, and may be similar to the mycelium, as in *Spharotheca* and *Erysiphe*; dissimilar and coiled at the end, as in *Uncinula* (see Fig. 5, Pl. III); acicular, with a swollen base, as in *Phyllostictinia*, or repeatedly two-forked, as in *Podosphæra* and *Microsphæra*. The appendages are characteristic in the different genera, and even in the different species of the same genus; notably so in *Microsphæra*.

The asci are delicate, colorless sacs, containing spores. The spores are quite uniform in shape, usually elliptical in outline, though varying in size and number. Indeed, the number of asci in each perithecium and the number of spores in each ascus constitute diagnostic characters of very great value. Besides, the form of the haustoria is extremely valuable in specific distinction.

As to classification, the Erysiphææ are at present considered a family of Perisporiaceæ, in the order Pyrenomycetes of the great class Ascomycetes. Thus:—

Class, ASCOMYCETES.

Order, PYRENO MYCETES.

Sub-order PERISPORIACEÆ.

Family ERYSIPHEÆ.

This family also possesses great interest on account of its economic bearings. The mildew of the rose, the hop, the gooseberry, the grape, and the lilac are well known. Injuries to cultivated plants must result from the presence of the parasite upon them. That the mildews are superficial in development is evident from the description just given but the effect upon the host frequently observed, is satisfactorily explained

by assuming that the fungus takes from the host plant the materials necessary for its growth and development. How far the presence of the mycelium upon the leaf may interfere with its normal function, cannot be stated.

Being superficial in growth and wholly superficial in the production of the fruiting bodies, the remedy is easily applied and fairly effective. Sulphur has been used successfully in the treatment of rose mildew in the greenhouse and the use of copper compounds as fungicides in spraying is rapidly becoming general. The mixtures recommended by the Experiment Station as remedies for apple scab and anthracnose of raspberries ought to prove efficacious with the *Erysipheæ*. The strength of the solution to be employed must be carefully determined by experiments upon the particular plant to be sprayed. Good remedies in careless hands may be the cause of as much injury as the fungus itself. On the other hand it may be said that the abandonment of gooseberry growing because the larger English varieties suffer greatly from mildew, is a doubtful expedient. As yet no good reason has come to light why spraying gooseberries for the mildew will not prove as beneficial as spraying apples for scab.

Precautionary measures are always in order: The fruiting bodies of the mildew are left upon the leaves or other parts at the close of the season's growth. The spores of the fungus are liberated only by the decay of the wall of the perithecium, which occurs when the leaves rot in the spring and early summer. Much would certainly be gained by gathering and burning all the leaves of diseased plants soon after they have fallen.

KEY TO THE GENERA OF *ERYSIPHEÆ*.

- A.** Appendages similar to the mycelium and interwoven with it:
 - 1. Only one ascus in each perithecium, *Sphaerotheca*.
 - 2. Several asci in each perithecium, *Erysiphe*.
- B.** Appendages distinctly different from the mycelium and usually separate from it:
 - 1. Appendages coiled at the tips, *Uncinula*.
 - 2. Appendages abruptly swollen at the base, tips straight, *Phyllactinia*.
 - 3. Appendages dichotomously branched at the tips:
 - a.* One ascus in each perithecium, *Podosphaera*.
 - b.* Several asci in each perithecium, *Microsphaera*.

SPHÆROTHECA, Lév.

Perithecium containing only one ascus. Appendages similar to the mycelium and frequently interwoven with it.

SPHÆROTHECA PANNOSA (Wallr.) Lév. Rose Mildew.

On species of *Rosa* both wild and cultivated. Fruit of the fungus scarce. Conidial stage only, collected.

Rosa (cultivated): Athens Co., Sept. 8, Aug. D. Selby; Columbus in greenhouse, January.

SPHÆROTHECA MORS-UVÆ (Schw.) B. & C. Gooseberry Mildew.

No specimens examined. Reported over the state especially on English varieties of gooseberry.

SPHÆROTHECA CASTAGNEI, Lév.

On *Taraxacum officinale*: Columbus, Aug. 20. Freda Detmers. *Bidens frondosa*: Franklin Co.—Georgesville, Sept. 24, Worthington, Oct. 3. Selby. *Erechthites hieracifolia*: Worthington, Oct. 3, Aug. D. Selby and W. C. Werner.

This is the commonest *Sphærotheca* conveniently obtained in fruit. It is reported upon a large number of composites and upon representatives of other orders.

SPHÆROTHECA PHYTOPTOPHILA, Kell. & Swingle. Mildew of the Hackberry Knot.

On *Cellis occidentalis* affected by a Phytoptus. The perithecia are found upon the distorted branchlets. Lima, May, 21, W. A. Kellerman, (no asci or spores), Columbus, Oct. 26, Selby.

The spores are rather late in maturing; the mycelium sparse. It would be very interesting to know how frequently the "knot" occurs without the mildew.

Other species of *Sphærotheca* are likely to be found in the state: *S. pruinosa*, C. & P. on *Rhus*, and *S. Humuli* (DC.) Burrill, on hop and Rosaceous plants are reported in our range, while *S. Mali* (Duby) Burr., a very interesting and somewhat anomalous one, occurring upon twigs of the apple, is reported from the Mississippi Valley. The young trees of the nursery and suckers from old ones are said to be most liable to attacks of the fungus.

ERYSIPHE (Hedw.) Lév.

Appendages as in *Sphærotheca*. Perithecium containing several asci.

ERYSIPHE LIRIODENDRI, Schw.

On *Liriodendron Tulipifera*: Columbus, September and October (conidial stage) Selby; Sugar Grove, Fairfield Co., Oct. 8, Nov. 7, Selby.

This species is reported as fruiting late. The observations made confirm this. The specimens from Sugar Grove are apparently abnormal

in the distribution of the dense mycelium bearing the perithecia. The mycelium is in narrow bands as if following the path of a leaf miner within or a larva without. In structure, size and number of asci and spores it answers to the description given.

ERYSIPHE COMMUNIS (Wallr.) Fr.

On *Clematis Virginiana*: Columbus—Weed, Oct. 15, Selby. *Clematis* (cultivated): Columbus, Oct. 15, and Nov. 5, Selby; Waynesville, Warren Co., Oct. 15, Kellerman. *Aquilegia Canadensis*: Gahanna (Columbus) September, Miss D tmers. The conidial stage of a mildew was taken on *Ranunculus* and *Oenothera* Columbus, Oct. 4-15, which is probably to be referred to *E. communis* since it is reported upon both of these hosts.

This species has not as yet been collected here upon *Leguminos e*. The larger number of spores in each ascus, 4-8, has chiefly been relied upon to distinguish it from the two following.

ERYSIPHE CICHORACEARUM, DC.

On *Eupatorium perfoliatum*: Columbus, Oct. 1, Weed. *Aster Shortii*: Columbus, Oct. 15, Selby. *A. ericoides* var. *villosus*: Columbus, Oct. 15, Selby. *A. prenanthoides*: Amanda, Fairfield Co., Oct. 1, Kellerman; Waynesville, Warren Co., Oct. 15, Kellerman. *A. puniceus*: Columbus, Oct. 4, Selby. *Aster* sp.: Columbus, Oct. 15, E. V. Wilcox; Meigs Co., Nov. 7, P. L. Pfarr. *Dahlia* (cultivated): Amanda, Oct. 1, Kellerman; Georgesville, Franklin Co., Sept. 24, Selby. *Ambrosia trifida*:—Georgesville Sept. 24 and Hilliard Sept. 21, Selby; Sugar Grove, Fairfield Co., Oct. 8, Selby; Bainbridge, Ross Co., Oct. 8, Kellerman; Haydenville, Aug. 11, Kellerman; Granville, Licking Co., Sept. 22, H. L. Jones. *A. artemisi folia*: Waynesville, Oct. 8, Kellerman; Columbus, Sept. 14, Weed, Sept. 16, Selby, Sept. 21, Miss Detmers. *Xanthium Canadense*:—Georgesville, Sept. 24, Selby & Werner. *Helianthus* sp.: Columbus, Aug. 13, Sept. 13, Weed, Oct. 7, Richardson; Granville, Sept. 22, Jones. *Helianthus strumosus*: Granville, Sept. 22, Jones. *H. decapetalus*: Columbus Sept. 24, Weed. *H. tuberosus*: Columbus, Sept. 18, Selby; Sugar Grove, Oct. 8, Selby; Bainbridge, Oct. 8, Kellerman; Waynesville, Oct. 15, Kellerman. *Actinomeris squarrosa*: Columbus, Sept. 24, Weed; Georgesville, Sept. 24, Selby, *Lactuca leucoph ea*: Athens, Aug. 11, Kellerman; Columbus, Oct. 3, 4, 15, Selby. (Conidial stage only on this host.) *Hydrophyllum macrophyllum*: Columbus, May 30, Selby; Nebraska, June 11, Kellerman. *Phlox* (cultivated): Amanda, July 30, Kellerman. *Echinosperrum Virginicum*: Ironton, May 27, Werner; Columbus, Oct. 15, Selby, (conidial stage only). *Verbena urtic folia*: Columbus, Sept. 16, Selby, Oct. 7, Richardson; Sugar Grove, Oct. 8, and Nov. 7, Selby. *V. hastata*: Columbus, Sept. 13, and 14, Weed. *Parietaria Pennsylvanica*: Columbus, Sept. 21, Selby.

This is the most common of all the mildews and occurs upon a large number of hosts, especially among *Compositæ*. The forms on *Hydrophyllum* and *Verbena* are not less abundant. That on the first named being the earliest in this locality to make its appearance out of doors as well as the earliest to mature its spores.

It is distinguished from the preceeding species by the smaller number of spores to an ascus, having almost uniformly two spores in each ascus. No marked deviations from this number have been observed. This character it possesses in common with *E. Galeopsidis* from which it is separated by the rounded haustoria.

ERYSIPHE GALEOPSIDIS, DC.

On *Scutellaria lateriflora*: Franklin Co.—Georgesville Sept. 24, Selby.—Worthington Oct. 3, (3 specimens) Werner; Sagar Grove, Fairfield Co., Oct. 8, Selby. *Stachys aspera* var *glabra*: Columbus, Sept. 24, Kellerman; Georgesville, Sept. 24, Werner. *Stachys cordata*: Georgesville, Sept 24, Selby. *Chelone glabra*: Ashtabula Co., Sara F. Goodrich.

As in the preceding there are two spores to an ascus. It is satisfactorily separated from *E. Cichoraccarum* only by its "lobed" haustoria. The host plants serve as a guide. Dr. Winter observes "that it is distinguished from the preceding by the spores only ripening in the following spring. Hence none but sterile asci are found in the perithecia upon the green host plant." This observation is confirmed by the examinations made.

ERYSIPHE GRAMINIS, DC. Wheat Mildew.

On *Agropyrum repens*: Ashtabula Co., June 22, Miss Goodrich. *Poa pretensis*: Columbus, Station greenhouse, March 4, and Scioto river Nov. 19, Kellerman. *Triticum vulgare*: Columbus April 22, Miss Detmers; Lima, May 21, Kellerman.

No perithecia were found on any of the specimens; only the conidial form called *Oidium monilioides*, Link. It is somewhat surprising to find it growing out of doors so late as on one of the specimens. The perithecia and spores are reported as late in developing.

UNCINULA, Lév.

Perithecia containing several asci; appendages coiled at the tips.

UNCINULA NECATOR (Schw.) Burrill. (*U. spiralis*, Berk. *U. Ampelopsidis*, Peck.) Grape Mildew.

On *Vitis* (cultivated): Columbus, July 26, Kellerman; Westerville, Franklin Co., L. H. McFadden; Granville Licking Co., Sept. 21, Herbert L. Jones. *Ampelopsis quinquefolia*: Columbus, Oct. 7, H. H. Richardson, Aug. 27 and Oct. 1, Weed, Sept. 10 and 22, Selby; Granville, Sept. 21, Jones.

Reported generally on both hosts. The forms differ only in the longer appendages of that occurring on *Vitis*.

UNCINULA FLEXUOSA, Peck.

Specimens are all amphigenous. On *Aesculus glabra*: Columbus Aug. 24, Sept. 24, Weed, Aug. 3, F. M. Webster.

This species is easily recognized by the flexuous appendages. It is reported only on *Aesculus*.

UNCINULA CIRCINATA, C. & P.

On *Acer dasycarpum*: Columbus Oct. 14, Weed; Sugar Grove, Fairfield Co., Oct. 8, Selby.

Like the species described from *Scutellaria*, this one has large depressed perithecia, but the asci are numerous and very narrow. The spores are eight in each ascus.

UNCINULA MACROSPORA, Peck.

On *Ulmus Americana*: Fairfield Co.; Amanda, Nov. 10 ('82) Kellerman; Franklin Co.—Columbus, Aug. 13, Weed, Sept. 26, Werner, Oct. 15, Selby, Worthington, Oct. 3, Werner and Selby. *Ulmus fulva*: Columbus, Aug. 13, Weed; Rock Mills, Fairfield Co., Nov. 1, Miss Detmers, Sugar Grove, Oct. 8, Selby; Waynesville, Oct. 8, Kellerman.

UNCINULA SALICIS (DC.). Winter.

On *Salix* sps.: Franklin Co.—Columbus, Oct., Weed and Craig, Oct. 4, E. E. Bogue, Oct. 9, Weed, Oct. 15, Selby, Oct. 17, Kellerman,—Georgesville, Sept. 24, Selby, Worthington, Oct. 3, Selby; Fairfield Co.—Amanda, Oct. 1, Kellerman. *Salix nigra*: Columbus, Sept. 24, Weed.

The very abundant mycelium of this mildew makes it conspicuous. It is found everywhere on willows.

UNCINULA COLUMBIANA, *sp. nov.*

Amphigenous. Mycelium moderately abundant, denser in patches, arachnoid. Perithecia large, usually light colored, scattered, depressed, longer diameter 130—160 μ , occasionally 180 μ , about twice the shorter; reticulations evident, small, 10—15 μ , commonly 10—12 μ . Appendages very numerous, 50 to 70 or more, hyaline, 130—185 μ in length, smooth,

rarely swollen at the tips, closely and abruptly coiled, arising from near the margin of the upper surface of the perithecium. Asci few, 4 to 6 or more, broadly ovate, pedicellate, $35-45 \times 50-70 \mu$, mostly $40 \times 65 \mu$; spores mostly 5, about $12 \times 25 \mu$. (Pl. III, Fig. 5.)

On *Scutellaria lateriflora*, Columbus, O., Oct. 13, 1892, Selby.

This species resembles *U. circinata*, C. & P., in form of perithecia, but is distinguished from it by the more abundant mycelium, by the broader asci and the fewer and larger spores. Unlike previously reported species of the genus its host is an herb and one commonly affected by an *Erysiphe*. A *Microspheera* has been reported from the same host by Professor Burrill. The material on hand is mature though rather scanty.

PHYLLACTINIA, Lév.

Perithecium containing several asci. Appendages acicular, acute at the tip, abruptly swollen at the base.

PHYLLACTINIA SUFFULTA (Reb.) Sacc.

On *Chelone glabra*: Columbus, Oct. 3, Selby. *Catalpa bignonioides*: Cedar Hill, Fairfield Co., Oct. 1, and Waynesville, Warren Co., Oct. 15, Kellerman. *Carpinus Caroliniana*: Amanda, Fairfield Co., Oct. 1, Kellerman. *Quercus nigra*: Lancaster, Oct. 28, ('83). Kellerman. *Quercus coccinea* var *tinctoria*: Rock Mills, Fairfield Co., Oct. 1, Miss Detmers. *Castanea saliva* var *Americana*: Gann, Knox Co., Nov. 1, H. J. Detmers. *Fagus ferruginea*: Worthington, Oct. 17, Miss Detmers.

The single species of the genus is reported upon a small number of herbs and not heretofore on *Chelone*.

PODOSPHÆRA, Kunze.

Perithecium containing a single ascus. Appendages free from the mycelium, dichotomously branched at the ends.

PODOSPHÆRA OXYACANTHÆ (DC.). DBy. Mildew of Cherry and Plum.

On *Prunus Cerasus*: Dayton Sept. 9, Jos. Potts; Columbus Sept. 19, Weed, Oct. 7, H. H. Richardson. *Prunus Chicasa*: Columbus, July 26, Miss Detmers.

This seems to be quite frequent in the region represented by the specimens.

MICROSPIHÆRA, Lév.

Adpendages as in *Podosphæra* or less branched. Several asci in each perithecium.

Several of the species of this genus are not separable, aside from host plants, except by the branching of the appendages and the character of the ultimate branchlets.

MICROSPHÆRA RAVENELLII, Berk.

On *Gleditschia triacanthos*: Columbus, Oct. '88, Weed and Craig, Sept. 4, Kellerman; Lancaster, Oct. 15, '82, Kellerman; Bainbridge, Ross Co., Oct. 8, and Waynesville, Miami Co., Oct. 15, Kellerman.

The separation of this from the following species depends chiefly upon the short, usually recurved tips of the appendages. The perithecia are about the same size as in *M. diffusa* but the asci are broader.

MICROSPHÆRA DIFFUSA, C. & P.

On *Desmodium canescens*: Columbus, Sept. 13, Weed, Sept. 18, Selby, Sept. 24, Miss Detmers.

Quite well distinguished by the elongated branches and spreading tips of the appendages—not at all recurved.

MICROSPHÆRA GROSSULARIÆ (Wallr.) Lév.

On *Sambucus Canadensis*: Franklin Co.—Columbus, Sept. 26, Kellerman—Worthington, Oct. 3, Selby.

This is well characterized by the erect, obtuse, digitate branchlets of the appendages. It is reported also upon species of *Ribes*.

MICROSPHÆRA VACCINII (Schw.) C. & P.

On *Vaccinium vacillans*: Sugar Grove, Fairfield Co., Oct. 8, Selby; Meigs Co., Nov. 7, P. L. Pfarr. *Gaylussacia resinosa*: Sugar Grove, Oct. 8, Selby.

This species is less difficult to distinguish: the appendages are generally quite long, the tips of the branches less regular, often truncate or bifid.

MICROSPHÆRA ELEVATA, Burrill.

On *Catalpa bignonioides*: Columbus, Oct. 13, Weed.

MICROSPHÆRA ALNI (DC.) Winter.

On *Euonymus atropurpureus*: Bainbridge, Ross Co., Oct. 8, Kellerman; Columbus, Oct. 3, Selby. *Syringa vulgaris*: Columbus, Nov. 6, E. E. Bogue, Sept. 16, and Dec. 10, Selby; Onwell, Ashtabula Co., Aug. 6, Bogue; Sugar Grove, July 18, Athens, Aug. 11, Kellerman. *Platanus occidentalis*: Columbus, Oct. 10, Selby. *Castanea sativa* var *Americana*: Sugar Grove, Sept. 20, Wilcox, Bogue and Weed; Bainbridge, Oct. 8, Kellerman.

Very common on *Syringa*. Only conidial stage found on *Euonymus* and *Platanus*.

However variable the length and divergence of the branches on *M. Alni* these are always symmetrical with the tips acute and distinctly recurved.

MICROSPHÆRA QUERCINA (Schw.) Burrill.

On *Quercus macrocarpa*: Columbus, Aug. 13, Weed. *Q. Prinus*: Columbus, Sept. 19, Weed. *Q. Muhlenbergii*: Columbus, Sept. 24. *Q. rubra*: Columbus, Nov. 7, E. V. Wilcox. *Q. coccinea* var *tinctoria*: Sugar Grove, Fairfield Co., Sept. 20, Wilcox, Bogue and Weed, Oct. 8, Selby; Lawrence Co., Oct. 29, Kellerman.

This interesting species has been reported only upon *Quercus*. The separation of forms of it from *M. Alni*, is made chiefly by reference to the host plants. The forms of *M. quercina* upon the different oaks vary greatly in length of appendages.

ARTICLE XIX.—CORRECTIONS AND ADDITIONS TO MOSES CRAIG'S CATALOGUE OF THE UNCULTIVATED FLOWERING PLANTS GROWING ON THE OHIO STATE UNIVERSITY GROUNDS.

BY W. A. KELLERMAN AND WM. C. WERNER, OHIO STATE UNIVERSITY.

The catalogue to which corrections and additions are here offered, was published in Vol. I, No. 2, of this Series, being, as stated in a footnote, a thesis presented to the Faculty of the Ohio State University, June 19, 1889. The work of making the catalogue was chosen in the fall of 1888, hence it is evident, as stated in the introduction, that the time was very short for completing the work, though the author had on hand notes and observations extending over some time previous. This sufficiently accounts for inaccuracies and incompleteness of the catalogue, which it is our purpose to correct and supply, so far as data at present warrant.

The desirability of having a fairly accurate and tolerably complete list of our plants must be evident to all—even if there is no direct interest in this flora, such as the Experiment Station heretofore necessarily had, and the Botanical Department of the Ohio State University still has. This desirability—necessity might perhaps be said—is both the motive and sole object of offering the lists that follow.

I. CORRECTIONS IN IDENTIFICATIONS.

(The numbers prefixed to the species are those of Craig's Catalogue.)

15. *Ranunculus repens*, L. Both the herbarium specimens and the plants of the localities referred to prove to be *R. septentrionalis*, Poir.

21. *Actaea spicata*, L. The herbarium specimen for the authentication of this species is *A. alba* Bigel.
30. *Corydalis aurea*, Willd. The plants of the given localities and all the herbarium specimens labeled *C. aurea*, are *C. flavula*, DC.
35. *Arabis hirsuta*, Scop. The specimen referred to in the University Herbarium is *A. dentata*, T. & G.
40. *Camelina sativa*, Crantz. Mr. Aug. D. Selby has one of the specimens referred to, authenticating this species; it is *Silene antirrhina*.
56. *Viola rotundifolia*, Mx. The specimen in the University Herbarium upon which this name is based, collected by Mr. Green, and labeled *V. rotundifolia*, is *V. pubescens*, Ait.
65. *Cerastium viscosum*, L. The *Cerastium* of the places mentioned is *C. nutans*, Raf., as is also a specimen in the Experiment Station Herbarium, labeled *C. viscosum*.
66. *C. arvense*, L., is *C. vulgatum*, L.
69. *Claytonia Caroliniana*, Mx. The specimens to authenticate this species are broad-leaved *C. Virginica*, L.
89. *Vitis rotundifolia*, Mx. The specimens prove to be *V. riparia* Mx.
112. *Desmodium viridiflorum*, Beck. Specimens in the University and Experiment Station Herbariums are *D. canescens*, and it is quite common on the island.
152. *Circaea alpina*, L. should be referred to *C. Lutetiana*, L., as is shown by the herbarium specimens and an examination of the plants in the locality named.
158. *Thaspium aureum*, Nutt. The specimens, both in the Experiment Station and University Herbariums, to represent this species, are *T. barbinode*, Nutt. The dates given, from May 13th to June 3d, are too early for *T. aureum*, which is a summer-blooming plant, usually not coming into flower until the end of June, and continuing in bloom through July.
175. *Vernonia Noveboracensis*, Willd. should read *V. altissima*, Nutt. The former (*V. Noveboracensis*) has not been observed on the grounds nor in Franklin county.
187. *Aster longifolius*, Lam. Mr. Craig had a specimen in his herbarium for authentication of this species; it was a small form of *A. Tradescantii*, L.
188. *Aster Novi-Belgi*, L. Specimens for verification of this, in the Experiment Station Herbarium, collected by Mr. Craig, and labeled *A. Novi-Belgii*, are *A. puniceus*, L.
191. *Erigeron bellidifolius*, Muhl. This plant would hardly grow in such a place as the wet ground near the lake swamp. *E. Philadelphicum* is quite abundant there, and owing to differences in the character of the ground, is quite variable in size and general appearance. It is undoubtedly the latter species that was collected. There are no authentic specimens, but we have no hesitancy in making this correction.

208. *Helianthus laetiflorus*, Pers. *H. tuberosus*, L. is very common near the river, but is not given in the list. Specimens in the University Herbarium labeled *H. laetiflorus* are *H. tuberosus*. None of the other species of *Helianthus* quoted in the list, except *H. decapetalus*, have been found by us.
233. *Hieracium scabrum*, Mx. A specimen of *Crepis biennis* (labeled *Hieracium scabrum*), was found in the Experiment Station Herbarium. It was collected on the University grounds, and may be the plant referred to. *H. scabrum* was not inserted in Selby & Craig's list of Franklin county plants, published later.
241. *Lactuca hirsuta*, Muhl. There is a specimen in the University Herbarium to authenticate this species; it is a top of *L. Floridana*, Gaert.
275. *Cuscuta glomerata*, Choisy. Mr. Craig had a specimen in his herbarium which represented the *C. glomerata* of the catalogue. It was *C. Gronovii*, Willd.
278. *Physalis Philadelphica*, Lam., should read *P. lanceolata*, Mx.
289. *Ilysanthes riparia*, Raf. The specimen to authenticate this was some other plant, but the species is not now remembered, the name not having been recorded at the time the above error was determined.
310. *Mentha arvensis*, L. Mr. Craig had a specimen of this plant in his herbarium; specimens are also in the University Herbarium. They are a form of *Mentha Canadensis*.
314. *Monarda fistulosa*, L. Both the plants of the localities named and the herbarium specimens are *M. clinopodia*, L.

NOTE. *Sassafras officinate*, Nees The tree noted was blown down during a wind storm in the fall of 1891. The species is, however, quite abundant along the Big Darby, near Georgeville.

364. *Urtica dioica*, L. This nettle is *U. gracilis*, Mx.
375. *Carya porcina*, Nutt. The tree referred to is *C. amara*, Nutt. There is a large tree of this hickory directly in front of the entrance to the Main Building, also several smaller ones along the northern portion of the woods. Three trees were standing in the pasture near the large bend in the brook, E. 2½, E. 3½. One of them was cut down the past year.
381. *Quercus prinoides*, Willd. The tree spoken of (near the Station Building) is *Q. Muhlenbergii*, Engelm. There are several other specimens of this species on the University grounds. We have seen no Ohio specimens of *Q. prinoides*.
392. *Ceratophyllum demersum*, L. This plant was not seen while searching for the *Myriophyllums* referred to later (Doubtful Identifications, Nos. 143-4). After seeing an authentic specimen of *C. demersum*, Mr. Craig said the plant he referred to as this species was something else.

429. *Cyperus dentatus*, Torr. Specimens of Mr. Craig's collecting, representing this plant, placed in the Experiment Station Herbarium, and labeled *C. dentatus*, are *C. esculentus*, L.
431. *Scirpus planifolius*, Muhl. It is impossible to say just which Sedge was intended, since several species not in the catalogue are abundant in the locality given. *S. planifolius* would hardly be found growing in such a place.
453. *Chrysopogon nutans*, Benth. A specimen in Mr. Craig's herbarium to authenticate this species, proves to be *Andropogon scoparius*, Mx.
464. *Bromus secalinus*, L. The *Bromus* referred to as common along the river, is not *B. secalinus*, but *B. ciliatus* L. The specimen of *B. ciliatus*, in the Experiment Station Herbarium, was labeled *B. secalinus*, L. The latter species occurs here and there on the cultivated portions of the University grounds.

II. DOUBTFUL IDENTIFICATIONS.

4. *Anemone nemorosa*, L. Nothing has been found by us to represent this species, but the var. *quinquefolia*, Gr. Dr. Britton, as a result of his study of this species, has decided that we do not have the true *A. nemorosa*, L., in America—the *A. quinquefolia* only occurring here.
13. *Ranunculus fascicularis*, Muhl. A thorough search for this plant reveals only forms of *R. septentrionalis*, Poir. The plant in question may be *R. hispidus*, Mx.
41. *Nasturtium officinale*, R. Br. This plant is always found in running or fresh water, never in water that is standing or stagnant as is that in the swamp near the river. The specimens labeled *Nasturtium officinale* in the University Herbarium are *Cardamine hirsuta*.
143. *Myriophyllum spicatum* L. and 144. *M. heterophyllum* Mx. A thorough but unsuccessful search was made for these two plants in the the localities named, the same season that the list was published.
359. *Ulmus racemosa*, Thomas. This tree can not be found in the locality named but *Ulmus Americana* grows along the entire river front.

III. CULTIVATED SPECIES TO BE STRICKEN OUT OF THE CATALOGUE, SINCE THEY DO NOT BELONG TO THE UNCULTIVATED FLORA.

85. *Ailanthus glandulosus*, Desf. Trees planted.
121. *Prunus Persica*, L.
122. *Prunus Cerasus*, L.
139. *Amelanchier Canadensis* T. & G. This like the preceding should be stricken out. It was brought to the place and planted for ornament.
142. *Liquidambar Styraciflua*, L. The tree west of the Main University Building was planted there and cannot be considered a part of the
6. Ex. Sta.—T. S.

uncultivated flora. Nothing of the kind could be found near the river in the locality named. It was left out of the flora of this county by Selby & Craig published subsequent to Craig's catalogue

- 166. *Cornus florida* L. Planted.
- 300. *Catalpa bignonioides*, Walt. Planted.
- 390. *Populus dilatata*, L. Planted.

IV. SPECIES OMITTED FROM SELBY AND CRAIG'S LIST OF FRANKLIN COUNTY PLANTS.

- 114. *Desmodium rigidum*, DC.
- 127. *Rubus cuneifolius*, Ph.
- 206. *Rudbeckia speciosa*, Wender.
- 212. *Helianthus trachelifolius*, Willd.
- 328. *Stachys aspera*, Mx. var. *glabra*, Gr.

We do not know the history of these and have seen none of the plants. Had they been correctly reported originally they doubtless would have been inserted in the list referred to, published by Selby and Craig a short time after.

V. ADDITIONAL SPECIES.

- 12a. *Ranunculus sceleratus*, L. Cursed Crowfoot.
In a ditch near west line fence of the University farm. W. 3 and 4.
S. 5. June, 1891.*

VIIa. CAPPARIDACEÆ.

- 53a. *Polanisia graveolens*, Raf.
Near Chemical Laboratory. Aug. 5, 1890, Aug. 1892. East side of Neil avenue near the brook, Sept. 1891. The last locality is now obliterated.
- 62a. *Silene noctiflora*, L. Night-flowering Catchfly.
Near the farm house on Woodward avenue, July 30, 1891.
- 75a. *Hibiscus Trionum*, L. Bladder Ketmia. Flower-of-an-hour.
In the vineyard and quince orchard. South of station building, Aug. 2, 1892. Noticed also at other places on the farm and campus.
- 145a. *Rotala ramosior*, Koehne.
Fields back of North Dormitory. W. 3 and 4. S. 4. Aug. 5, 1890.
- 155a. *Angelica atropurpurea* L.
On the island N. 1½, W. 4½. First observed during the summer of 1891.

* The dates in this list indicates only the first collecting of the species after the publication of the catalogue.

- 159a. *Cryptotaenia Canadensis*, DC. Honewort.
Quite common near the river, also found on bank south of the Botanical Building, July 31, 1890. Occasionally met with in the woods.
- 171a. *Galium trifidum* L. Small Bedstraw. Cleavers.
Hillside south of Botanical Building, Aug. 4, 1890.
- 173a. *Cephalanthus occidentalis*, L. Button Bush.
East margin of lagoon. W. $4\frac{1}{2}$, S. $\frac{1}{2}$, Aug. 1890.
- 184a. *Aster sagittifolius*, Willd.
Abundant all along the river. It must have been confounded with *A. cordifolius*, L., Aug. 5, 1890.
- 215a. *Bidens connata*, Muhl. Swamp Beggar-ticks.
Edge of the brook, north of Neil avenue, Aug. 1891.
- 231a. *Centaurea Jacea*, L.
East of Mechanical Laboratory, S. 1, E. $\frac{7}{8}$.
- 250a. *Samolus Valerandi*, L. var. *Americana*, Gray. Water Pimpernel.
Brook weed.
Margin of the brook west of Neil avenue to bottom land back of North Dormitory, Aug. 5, 1890.
- 256a. *Asclepias tuberosa*, L. Butterfly-Weed. Pleurisy-root.
Hillside south of Botanical Building, Aug. 1890.
- 288a. *Mimulus alatus*, Ait. Monkey flower.
Found along the river with *M. ringens* and equally abundant, Aug. 1890.
- 288b. *Gratiola Virginiana*, L. Hedge Hyssop.
Found along the brook and river also in the low ground bordering the lagoons.
- 312a. *Lycopus Virginicus* L. Bugle-weed. Margin of brook near High street, Aug., 1891,
- 309a. *Mentha viridis*, L. Spearmint. Just south of fence dividing the pasture from the lot of farm house on Woodward avenue. S. $3\frac{3}{4}$, E. $3\frac{3}{4}$. June, 1891.
- 335a. *Amarantus blitoides*, Watson. Amaranth. In the pasture between the campus and High street. Aug. 1, 1890.
- 335b. *Acnida cannabina*, L. Water-Hemp. Fields back of North Dormitory.
- 336a. *Chenopodium Boscianum*, Moq. Pigweed. Back of Electrical Building. Aug., 1890.
- 343a. *Polygonum Pennsylvanicum*, L. Knotweed. Very common in cultivated ground. Aug., 1890.
- 343b. *Polygonum Muhlenbergii*, Watson. Knotweed. Only a few were found in the low ground near the western boundary, Aug., 1890.

- 343c. *Polygonum Persicaria*, L. Lady's Thumb. Abundant in cultivated ground. Aug., 1890.
- 347a. *Polygonum sagittatum*, L. Arrow-leaved Tear-Thumb. Margin of brook opposite Prof. Knight's house. Aug. 22, 1890.
(Specimens were collected of quite a number of *Willows* growing around the river and lagoons. They have not yet been critically studied).
- 394a. *Vallisneria spiralis*, L. Tape-grass, Eel-grass. Quite abundant in the lagoons near the river. Aug. 23, 1890.
- 403a. *Smilacina stellata*, Desf. False Solomon's Seal. Near the edge of the black mucky soil back of the north Dormitory. May, 1891.
- 411a. *Juncus nodosus*, L. var. *megacephalus*, Torr, Rush. Margin of lagoon near river. Aug. 23, 1891.
- 428a. *Potamogeton natans*, L. Pond weed. In lagoons near river. Aug. 9, 1890.
- 428b. *Potamogeton pectinatus*, L. Pond weed. In lagoons near river. Aug. 9, 1890.
- 428c. *Cyperus diandrus*, Torr. Borders of brook between Neil avenue and the river. July 31, 1890. Also along margin of lagoon near the river.
- 428d. *Cyperus aristatus*, Rottb. Borders of brook west of Neil avenue. July 31, 1890. Borders of lagoon near river. Aug. and Sept., 1891.
- 428e. *Cyperus erythrorhizos*, Muhl. Field back of North Dormitory, rare. Aug. 23, 1890.
- 430a. *Cyperus strigosus*, L. July 31, 1890. }
- 430b. *Cyperus speciosus*, Vahl. Aug. 2, 1890. }
- Both these species are found along the brook between Neil avenue and the river, also in the fields back of the Veterinary Hospital and Dormitory. The *C. esculentus* of the catalogue must refer to one or both of these plants since that species was referred to as *C. dentatus*.
- 430c. *Kyllingia pumila*, Mx. Margin of lagoon near river. Oct., 1891.
- 430d. *Eleocharis ovata*, R. Br. Margin of brook near river, Aug. 2, 1890, and edge of lagoon, Aug. 9, 1890.
- 430e. *Eleocharis intermedia*, Schultes. Edge of lagoon near river. Aug. 9, 1890.
- 430f. *Scirpus pungens* Vahl. Margin of river. July 31, 1890. Also common in the lagoons.
- 430g. *Scirpus lacustris*, L. Growing with *Scirpus pungens*.
- 530h. *Scirpus fluviatilis*, Gray. (?). There is a *Scirpus* growing in the lagoons which is undoubtedly this species though no inflorescence has been observed. Aug., 1890.
- 445a. *Carex grisea*, Wahl. Near the river. May, 1891.
- 445b. *Carex laxiflora*, Lam. var. *latifolia*, Boot. In the clump of timber at the north end of the lagoons. June, 1891.
- 445c. *Carex pubescens*, Muhl. Rather abundant in the woods. Aug., 1890.

- 445d. *Carex Shortiana*, Dewey. Plentiful in the woods and various other places. It is the most common *Carex* in the low ground at the west extremity of the lake. June, 1891.
- 445e. *Carex stenolepis*, Torr. This is the most common *Carex* along the brook between High street and Neil avenue. It is occasionally met with in the woods and other damp localities. Aug. 2, 1890.
- 445f. *Carex stipata*, Muhl. Frequent along the the line of the brook, in the woods and along the river. Aug., 1890.
- 445g. *Carex stricta*, Lam. Low land adjoining the lagoons. June, 1891.
- 445h. *Carex tentaculata*, Muhl. In the woods and timber belt along the river and lagoons. Aug., 1890. Several of the *Carices* given in the catalogue have not as yet been found by us.
- 446a. *Panicum glabrum*, Gaudin. }
- 446b. *Panicum proliferum*, Lam.)
 July 31, 1890. These two grasses were found to be most troublesome weeds in the lawn near the Botanical Building, especially the first which formed large unsightly mats. Both are frequently met with on the campus and in the pastures.
- 452a. *Leersia Virginica*, Willd. First observed in a bed of ferns near the Botanical Building, Aug. 9, 1890. Rather common in the woods, occasional masses of it have been found along the line of the brook.
- 455a. *Muhlenbergia Mexicana*, Trin. Common along the brook and river and land bordering the lagoons. Aug. 1, 1890.
- 455b. *Alopecurus geniculatus*, L., var. *aristulatus*, Torr. Margin of the brook south of the Botanical Building. June, 1891.
- 456a. *Sporobolus vaginæstorus*, Vasey. Frequent in portions of the pasture near High street and on the campus, especially around the Main Building and Chemical Laboratory.
- 457a. *Agrostis alba*, L. Common. June, 1891.
- 457b. *Cinna arundinacea*, L. Common along the river and around the lagoons. Aug., 1890.
- 459a. *Eragrostis reptans*, Nees. Margin of brook and borders of lagoon. July 31, 1890.
- 459b. *Eragrostis Frankii*, Meyer. Fields in the bottom lands back of the north Dormitory. Aug. 5, 1890.
- 459c. *Eragrostis Purshii*, Schrader. Dry places and along paths and drives on the campus. July 31, 1890.
- 459d. *Eragrostis capillaris*, Nees. Fields back of Veterinary Hospital Aug. 5, 1890.
- 461a. *Poa annua*, L. Door yard of farm house on Woodward avenue. July, 1891.
- 462a. *Glyceria nervata*, Trin. Common in the woods. Aug. 9, 1880.
- 463a. *Festuca nutans*, Willd. Found in the timber north of the lagoon. June, 1891.
- 464a. *Bromus racemosus*, L. Frequent on the farm. June, 1891.

467a. *Elymus Canadensis*, L. This species is very abundant near the river, rather more so than *E. Virginicus*. Aug., 1890.

467b. *Elymus striatus*, Willd. Aug., 1890. A single plant found.

The FERNS are not included in Mr. Craig's catalogue. Of this group we have found in the woods three species, namely:

Cystopteris fragilis, Bladder fern.

Botrychium ternatum obliquum, Grape fern.

Botrychium ternatum dissectum, Grape fern.

ARTICLE XX—NOTES ON DISTRIBUTION OF AND STATIONS FOR A FEW RARE AND INTERESTING OHIO PLANTS.

By WM. C. WERNER, Ohio State University.

RANUNCULUS FASCICULARIS, MUHL.

The only specimens that have come to my notice are from; Toledo, J. A. Sanford; Springfield, Mrs. E. J. Spence; Georgesville, Franklin Co., Aug. D. Selby.

ARABIS PATENS, SULLIV.

Rocky banks of the Scioto, near Columbus.

This Sullivants original locality, is still so far as we know by specimens the only one in Ohio. Rediscovered a few years ago by Aug. D. Selby.

NAPÆA DIOICA, L.

Sugar Grove, Fairfield Co., E. V. Wilcox; Springfield, Mrs. E. J. Spence.

SULLIVANTIA OHIONIS, TORR. & GRAY.

So far as I know this plant has not been collected in Ohio since its first discovery in Highland Co. by Mr. W. S. Sullivan.

The past season it was found by Prof. Kellerman near the Rock House in Hocking Co, and at Mineral Springs, Adams Co.

I collected it at Fultonham, Muskingum Co.

Both of Prof. Kellerman's localities are of sandstone formation that of Fultonham is sub-carboniferous limestone.

LIQUIDAMBAR STYRACIFLUA, L.

Otway, Scioto Co., W. A. Kellerman.

CORNUS CANADENSIS, L.

In the Beardslee catalogue this species is given for Summit Co., Dr. Newberry as authority. And for Painesville, Miss Prescott.

Miss Prescott found only a few specimens.

In 1880 Dr. L. B. Tuckerman met with it near Morgan, Ashtabula Co.

While botanizing east of Painesville during the spring of 1885 I found a patch of these plants about a rod square. This station is about obliterated.

Mr. H. L. Jones in his catalogue of the plants of Licking Co. notes its rare occurrence in one locality. From the fact that it has been observed in central Indiana we may hope to find it in rich wooded sections across the state.

SOLIDAGO OHIOENSIS, RIDDELL.

This species was described by Dr. Riddell in 1835, the localities given were, "Cleve's prairie Dayton, and two miles south from Columbus."

Last autumn Mr. E. M. Wilcox, rediscovered it along the canal near the southern outskirts of the city. This may be Riddell's Columbus Station for this species. The past autumn I found it in the Cedar swamps, in the southern part of Champaign Co.

An effort will be made next summer to find out whether it still exists in the Dayton locality.

SOLIDAGO RIDDELLII, FRANK.

Peat bogs near Gypsum, Ottawa Co., W. Krebs; Springfield, Mrs. E. J. Spence.

South of Columbus growing with *S. Ohioensis*, Werner. A search will be made for this plant in the original localities given by Dr. Riddell viz: Scott's plains, 12 miles E. from Worthington, Franklin Co., Hoffman's Prairie 8 miles E. from Dayton.

HELIANTHUS OCCIDENTALIS, RIDDELL.,

Georgesville Franklin Co., Werner.

I cannot say if the plant still exists near Dover, Tuscarawas Co., the region where Riddell first found it.

PLANTAGO MAJOR, L.

This plant appears to be rare in Ohio. I have found it sparingly at Painesville for the past twelve years, and the past season, along the roadside near Cedar swamps Champaign Co. No specimens from any other locality have been seen.

PHORADENDRON FLAVESCENS NUTT.,

Mathew McCleary, Ava, Noble Co.,
Southern Scioto Co., W. A. Kellerman.
Lawrence Co. along the Ohio river, Werner.

At the meeting of the University biological club held Sept. 20, 1892 stations for this plant were reported as follows: 10 miles southeast of Batavia, Clermont Co., H. A. Surface; Athens Co., Aug. D. Selby; Morgan Co., 3 miles north of Athens Co. line, C. B. Morrey.

QUERCUS NIGRA, L.

Lawrence Co., W. A. Kellerman.
The only locality from which specimens are at hand.

QUERCUS IMBRICARIA × *COCCINEA* (*Q. LEANA*, NUTT).

Preston, Hamilton Co., one tree, reported by Prof. A. P. Morgan;
Cincinnati, one tree reported by Joseph F. James; Brownsville, Licking Co., one tree, since cut down, W. A. Kellerman.

THUYA OCCIDENTALIS, L.

"Falls of the Little Miama", Daniel Drake in picture of Cincinnati. p. 83.

Ross Co., W. A. Kellerman.

Banks of the Scioto river north west of Columbus, and Cedar swamps south of Urbana, Werner. In the latter place I found trees ranging from fifty to ninety feet in height and over two feet in diameter. A sawmill has been in operation for quite a number of years cutting the timber into boards.

Riddell notes *Cupressus thyoides* L. for the "rocky banks of the Scioto river". Sullivant gives it for Franklin Co., Dr. Newberry's catalogue quotes this species for eastern and southern Ohio. The Beardslee

catalogue gives it for Urbana swamps, Sullivant as authority. Since the *Thuya* was found in two of the localities given it may perhaps be correctly assumed that the *Chamæcyparis thyoides* (L.) B. L. P. (*Cupressus thyoides*) does not after all come within our range.

IRIS CRISTATA, AIT.

This species is comparatively new to our lists of Ohio plants. It was first brought to light by Mr. R. H. Ingraham, Trumbull Co. Although Mr. Aug. D. Selby had seen it in the hills of Lawrence Co. several years before. Mr. Wm. Krebs has sent in specimens from near Cleveland. The past season I found it near Georgesville, Franklin Co. Prof. Wright gives it in his catalogue of Lorain Co. plants.

POLYPODIUM INCANUM, SWARTZ.

Adams Co., W. A. Kellerman.

ASPLENIUM PINNATIFIDUM, NUTT.

Fairfield Co., E. V. Wilcox ; Lawrence Co., Werner.

ARTICLE XXI.—NEW PLANTS FOR THE FLORA OF OHIO.

BY WM. C. WERNER, Ohio State University.

When no authority is given the writer is responsible for the locality.

In the compilation of this list, only such species have been included as have not heretofore been noted for Ohio in any of the state catalogues of Ohio plants.

Quite a number of adventive or naturalized plants are admitted, most of which are of recent introduction, while several have been observed for years. All the species given are represented by herbarium specimens.

Aconitum Noveboracense, Gray.

Cuyahoga Falls, Summit Co., W. Krebs, 1890.

A. *Uncinatum* L. was given for the same locality in Dr. Beardslee's catalogue of the plants of Ohio. Prof. E. W. Claypole of Akron tells me he has seen only A. *Noveboracense* in that locality.

Ranunculus arvensis, L.

Painesville, Lake Co. First observed in 1888.

Ranunculus Ficaria, L.

Painesville, Lake Co., Otto Hacker, 1892.

Cardamine arenicola, Britton.

Geneva, Ashtabula Co., Miss S. F. Goodrich, 1882. Specimen identified by Dr. Britton.

Thlaspi arvense, L.

Toledo, J. A. Sanford, 1878. A single specimen in the University herbarium.

Lechea racemulosa, Michx.

Fairfield Co., 1890. Adams Co., W. A. Kellerman, 1892.

Claytonia perfoliata, Donn.

Painesville, Otto Hacker, observed nearly every season since 1886.

Stellaria graminea, L.

Near Cleveland, Wm. Krebs, 1890.

Lychnis vespertina, Sibth.

Cleveland, Wm. Krebs, 1891. Painesville, Otto Hacker, 1892.

Ascyrum Crux-Andraeae, L.

Sugar Grove, Fairfield Co., E. V. Wilcox, 1890. Lawrence Co., 1892.

Hypericum Canadense, L., var. *majus*, Gray.

Gypsum, Ottawa Co., Wm. Krebs, 1890.

Hypericum petiolatum, Walt. (*Elodes petiolata*, Pursh).

Painesville, Lake Co., First collected in 1885.

Geranium columbinum, L.

Painesville, Otto Hacker, 1892.

Geranium dissectum, L.

Painesville, Otto Hacker, 1892.

Oxalis corniculata, L.

Painesville, Otto Hacker, 1892; Monroe Co., H. Herzer, 1892; Rio Grande, Gallia Co., W. W. Deckard, 1892.

Meibomia obtusa (Muhl.), A. M. Vail. (*Desmodium ciliare*, DC.)

Summit Co., Wm. Krebs, 1890; Georgesville, Franklin Co., 1892.

Ribes nigrum, L.

Lake Shore near Cleveland, Wm. Krebs, 1890; Fields near Painesville, Otto Hacker, 1892.

Myriophyllum heterophyllum, Michx.

Geneva, Miss S. F. Goodrich.

Opuntia Rafinesquii, Englm.

Cedar Point Ottawa Co., Wm. Krebs.

Cornus asperifolia, Michx.

Toledo, J. A. Sanford, 1878; Springfield, Mrs. E. J. Spence, 1878; Georgesville, Franklin Co., Aug. D. Selby, 1891.

Viburnum nudum, L. var. *cassinoides* (L.), Jacq.

Painesville, 1889; Ashtabula Co., E. E. Bogue, 1890.

Symphoricarpus racemosus, Michx. var. *pauciflorus*, Robbins.

Cedar Point, Ottawa Co., W. Krebs, 1890.

Lonicera japonica, Thunb.

There is a dense growth of this Honeysuckle on an embankment of the C. H. & D. R. R. about two miles south of Ironton, Lawrence Co., 1892.

Lonicera oblongifolia, Muhl.

Lake shore near Cleveland, W. Krebs, 1890.

Lonicera xylosteum, L.

Painesville, Otto Hacker, 1891. This shrub is frequently found in fence corners and thickets in the vicinity of a nursery. The seeds having become widely scattered through the agency of birds.

Galium verum, L.

Painesville, Otto Hacker, 1888.

Aster viminalis, L.

Cleveland, E. Claassen, 1891.

Eupatorium serotinum, Michx.

On grounds of Sells Brothers' circus Columbus, E. M. Wilcox, 1891.

Liatris cylindracea, Michx.

Georgesville, Franklin Co., Aug. D. Selby, 1890.

Senecio viscosus, L.

Painesville, Otto Hacker, 1892.

Centaurea Jacea, L.

Richland Co., E. Wilkinson, 1892.

Lobelia puberula, L.

Rio Grande, Gallia Co., J. W. Davis, 1892.

Hottonia inflata, Ell.

South New Lyme, Ashtabula Co., Miss F. S. Tuckerman.

Erythraea Centaurium, Pers.

Painesville, J. Wetzel.

Heliotropium anchusæfolium, Poir.

Spontaneous in a nursery where it has been observed since 1872.

Mentha aquatica L. var. *citrata*, (*M. citrata*, Ehrh).

Columbus, E. M. Wilcox, 1892.

Pycnanthemum muticum (Michx.), Pers. var. *pilosum*, Gr.

Dover Bay, Cuyahoga Co., E. Claasen, 1890. Springfield, Mrs. E. J. Spence.

Bignonia capreolata, L.

Ironton and Hanging Rock, Lawrence Co., 1892; Abundant in Symmes Creek Valley Lawrence Co., W. A. Kellerman, 1892.

Chenopodium glaucum, L.

Toledo, J. A. Sanford, 1878.

Polygonum Hartwrightii, Gray.

Springfield, Mrs. E. J. Spence.

Habenaria peramœna, Gray.

Sugar Grove, Fairfield Co., E. V. Wilcox, 1891 ; Rio Grande, Gallia Co., Lizzie Davis, 1892.

Eleocharis quadrangulata, R. Br.

Summit Co., E. Classen, 1890.

Scirpus sylvaticus, L.

Richland Co., E. Wilkinson, 1892.

Carex lupulina, Muhl, var. *pedunculata*, Dewey.

Painesville and Licking reservior, 1891.

Carex communis, Bailey. var. *Wheeleri*, Bailey.

Sugar Grove, Fairfield Co., 1891.

Bromus purgans, L.

Painesville, 1879. Franklin Co., 1891.

Eatonia Dudleyii, Vasey.

Painesville, 1879 ; Fairfield and Franklin counties, 1891 ; Marion Co., W. D. Whipps, 1892. This seems to be the common *Eatonia* of Ohio. I have thus far found *E. Pennsylvanica* only at Painesville.

Buxbaumia aphylla, L.

Painesville, 1876.

Fosombronia cristata, Lindb.

Rendville, Perry Co., 1891. Identified by Prof. L. M. Underwood.

ARTICLE XXII.—NOTES ON RARE OHIO PLANTS.

By AUG. D. SELBY.

As a brief contribution toward the improvement of our knowledge of plant distribution in Ohio, the following notes are offered on the three species placed before the Academy.

ERYSIMUM ASPERUM, DC. A crucifer called Western Wall-flower appears to be infrequently met with in the state. It occurs at intervals along the limestone exposures of the Scioto river near Columbus; its occurrence might be expected over two-fifths of the state.

SILENE ROTUNDIFOLIA, Nutt. A peculiar and rather rare species, occurs in abundance at Ash Cave, Hocking county. A number of specimens were taken in August 1889. The favorite habitat is the secluded moist, shaded and sand-covered ledges of the friable sandstones.

GONOLOBUS OBLIQUUS, R. Br. One of the twining Milkweeds, (whose general distribution is coast-wise or south Appalachian) has been collected frequently by the writer along the banks of the Scioto north of Columbus. Mr. J. S. Hine has taken it by the Big Darby near Georgesville (Franklin county). It doubtless occurs in many other localities in the state. The flowers are reported fragrant, they certainly have an odor

ARTICLE XXIII.—NEW OR RARE PLANTS OF OHIO.

By W. A. KELLERMAN.

A beautiful specimen of the American Holly (*Ilex opaca*) twenty-eight feet high and twenty-eight inches in circumference at the base, was found the past season in the south eastern portion of Lawrence county. The tree was near a log cabin but the evidence collected seemed to establish conclusively the fact that it was a native. No others were found in the neighborhood. Though south of the Ohio river the species is abundant. This may then perhaps be properly added to the list of native Ohio plants.

A fine specimen of Lea's Oak (*Quercus Leana*) was found early in the winter in the southeast corner of Licking county. It has since been cut down. It was in a small grove with Black and Laurel oaks. In character of leaves and fruit it strongly approaches *Quercus imbricaria*; indeed it could easily be considered a *variety* of the latter. The only other trees of this rare oak so far as reported in the state are in or near Cincinnati.

A form of the Pitch Pine, which has been designated as *Pinus rigida* var. *lutea*, Kellerman, and described before the A. A. A. S. Rochester meeting, August 1892 (See Botanical Gazette XVII, 280) was found sparingly with the species in the southern portion of Fairfield county.

4
See 1637.5.5

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Wooster, Ohio, July, 1896.

ARTICLE XXIV:

A PRELIMINARY LIST

OF THE

Birds of Wayne County, Ohio.

BY

HARRY C. OBERHOLSER.

The Bulletin of this Station is sent free to all residents of the State who request it. Persons who receive duplicate copies of the Bulletin, or who do not care to receive any, are requested to notify the Station, as the edition is not sufficient to supply the urgent demand for it.

All correspondence should be addressed to EXPERIMENT STATION, Wooster, Ohio.

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AUGUSTINE D. SELBY, B. SC.....	"	Botanist and Chemist
PERCY A. HINMAN	"	Bursar
LLOYD M. BLOOMFIELD, B. AGE.....	"	Assistant Chemist
CHARLES W. MALLY, M. SC.....	"	Assistant Entomologist
WILLIAM HOLMES	"	Foreman of Farm
CHARLES A. PATTON.....	"	Ass't Foreman and Meteorologist
W. A. PORTER.....	"	Florist
WILLIS G. HARRY.....	"	Dairyman
ANNIE B. AYRES.....	"	Mailing Clerk
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J. E. BARCLAY.....	Neapol's	Supt. Northwestern Sub-Station
EDWARD MOHN.....	Strongsville.....	Supt. Northeastern Sub-Station

The Bulletins of this Station are issued at irregular intervals. They are paged consecutively, and an index is included with the final number of each volume.

Notice.

BY THE DIRECTOR.

The Technical Series of the bulletins of this Station was begun as a channel for the publication and preservation of papers, the incidental product of the investigations of the Station, but which, by reason of their technical character, are of interest chiefly to those engaged in scientific research.

While the papers thus far published in this series are all more or less fragmentary and many relate to other lines of work, the leading object in view has been the collection of material which may some day be worked into a systematic biological survey of the State, this to serve as the basis of a more accurate knowledge than is now possessed for the prosecution of the more distinctively economic work.

The previous issues in this series have been as follows:

TECHNICAL SERIES, VOL. I, NO. 1, OCTOBER, 1889.

- Article I.—Preparatory stages of the 20-spotted Ladybird. (Illustrated.) *C. M. Weed.*
Article II.—Studies in pond life. (Illustrated).. *C. M. Weed.*
Article III.—A partial bibliography of insects affecting clover..... *C. M. Weed.*

TECHNICAL SERIES, VOL. I, NO. 2, MAY, 1890.

- Article IV.—Flowering plants on the grounds of the Ohio State University. *Moses Craig.*
Article V.—Fourth contribution to the life history of little known plant lice. *C. M. Weed.*
Article VI.—Descriptive catalogue of the shells of Franklin county, Ohio. (Illustrated) *H. A. Surface.*

TECHNICAL SERIES, VOL. I, NO. 3, APRIL, 1893.

- Article VII.—Methods of oviposition in the Tipulidæ. (Illustrated)..... *F. M. Webster.*
Article VIII.—A Dipterous gall-maker and its associates. (Illustrated).. *F. M. Webster.*
Article IX.—Description of a new species of gall-making Diptera. (Illustrated.) *John Marten*
Article X.—Description of a species of Chlorops reared from galls on *Muhlenbergia mexicana*..... *S. W. Williston.*
Article XI.—Notes on some species of Ohio Hymenoptera and Diptera heretofore undescribed. (Illustrated) *F. M. Webster*

- Article XII.—Descriptions of new parasitic Hymenoptera bred by F. M. Webster. (Illustrated) *Wm. H. Ashmead.*
- Article XIII.—A Tachinid reared from cells of a mud-dauber wasp *C. H. Tyler Townsend.*
- Article XIV.—Additions to the preliminary list of the Uredineæ of Ohio *Freda Detmers.*
- Article XV.—Bibliography of Ohio botany *W. A. Kellerman.*
- Article XVI.—Experiments in the germination of treated seed *W. A. Kellerman.*
- Article XVII.—Analytical synopsis of the groups of fungi *W. A. Kellerman and Aug. D. Selby.*
- Article XVIII.—The Ohio Erysiphææ. (Illustrated)..... *Aug. D. Selby.*
- Article XIX.—Corrections and additions to Moses Craig's catalogue of the uncultivated flowering plants growing on the grounds of the Ohio State University *W. A. Kellerman and Wm. C. Werner.*
- Article XX.—Distribution of and stations for a few rare and interesting Ohio plants. *Wm. C. Werner.*
- Article XXI.—New plants for the flora of Ohio..... *Wm. C. Werner.*
- Article XXII.—Notes on rare Ohio plants..... *Aug. D. Selby.*
- Article XXIII.—New or rare plants of Ohio..... *W. A. Kellerman.*

These bulletins are paged consecutively, and a complete index will be published in the final number of the volume. The bulletins of this series are sent only to other stations, to public libraries, scientific societies, and to such individuals as expressly request them.

A limited number of these bulletins can be furnished to applicants.

BULLETIN

OF THE

OHIO AGRICULTURAL EXPERIMENT STATION.

VOL. I, No. 4.

TECHNICAL SERIES.

JULY, 1896.

Article XXIV.—A Preliminary List of the Birds of Wayne County, Ohio.

BY HARRY C. OBERHOLSER.

INTRODUCTION.

THE present catalogue is the outgrowth of a request made some time since by Prof. F. M. Webster, Entomologist of the Ohio Agricultural Experiment Station, who desired the writer to prepare a report on the avifauna of Wayne County, the new location of the Station. Although this task was undertaken with no little hesitation, it has been the aim of the author to offer a list as complete as possible, with such annotations as seem to be of interest in this connection.

That the number of species is far from exhaustive is of course unnecessary to state. No one more than the writer regrets this evident incompleteness, which is principally due to the comparatively short period covered by the writer's observations, and to the fact that the only opportunities for such investigations were the leisure hours of an active business life. That the present paper may serve as a basis for future observations is the chief excuse for its existence. With this purpose in view much care has been exercised to avoid the inclusion of any but perfectly

reliable records. All but four species¹ have been personally identified by the writer, either in the field or from specimens in local collections; and these four exceptions have been admitted only upon what has been considered satisfactory evidence of their occurrence. Species of doubtful or of probable occurrence, while excluded from the list proper, have been separately enumerated as a guide to future observations.

The notes from which this paper has mainly been compiled were taken by the writer between February 8, 1890, and April 9, 1894; during which time almost all of the County, excepting the extreme northeastern and southwestern portions, was visited. The data here utilized were, however, obtained chiefly in the vicinity of Wooster, within a radius of about six miles of the city. This information has been supplemented by the examination of a number of collections of mounted birds from different parts of the County; evidence of the occurrence of a number of species not otherwise noted having been thus secured. Statements in regard to the abundance of species have in most cases been carefully estimated from comparisons of the actual number of individuals recorded, and may therefore be regarded as approximately correct. The annotations are drawn almost entirely from notes relating to Wayne County, and unless it is otherwise specifically stated, are intended to reflect the status of the species in question merely with respect to the region under consideration.

The nomenclature, and the classification, which at the suggestion of Prof. Webster has been given entire, are of course those of the Check List of the American Ornithologists' Union, including the recent emendations. The illustrations, which are also the result of a suggestion by Prof. Webster, have been here reproduced through the courtesy of Messrs. Estes and Lauriat, of Boston, Mass. The writer desires furthermore to express to Prof. F. M. Webster his sincere appreciation of much indispensable assistance in the preparation of this report. Thanks are also due to Mr. Joseph Housekeeper, of Wooster, for information in regard to some of the water birds; to Mr. Ellsworth Freeman, of Orrville, as well as to the other gentlemen who have kindly permitted the writer to examine birds in their possession, and whose names appear in the following pages.

Wayne County is situated in the northeastern portion of Ohio, about thirty-five miles from Lake Erie and about fifty-five miles west of the State line of Pennsylvania. The forty-first parallel of north latitude forms its northern boundary. It is in shape nearly square, being twenty-five miles from east to west, and about twenty-three miles in north and south extent, with an area of 535 square miles. The towns mentioned in the ensuing pages are situated as follows: Wooster lies about three or four

¹ These are: *Meleagris gallopavo*, *Pandion haliaëtus carolinensis*, *Ceophloeus pileatus* and *Acanthis linaria*.

miles southwest of the geographical center of the County, and nearly a mile from the present course of Killbuck Creek; Orrville is about eleven miles northeast of Wooster, and six miles from the eastern boundary; West Salem is located in the extreme northwest corner of the County, while Shreve lies close to the southern line, and five or six miles from its western limit.

The County itself lies upon the southern slope of the watershed which separates the streams flowing into Lake Erie from those tributary to the Ohio River; its northern boundary being close to the top of the dividing ridge, the summit level of which is found in the vicinity of Akron, in Summit County. The altitude of the highest point of land within Wayne County is 1,042 feet, this being in the extreme north-eastern township. In some of the surrounding counties the highest elevations range from 300 to 400 feet higher; while the maximum in the State is attained in Logan County, where the altitude is 1,540 feet above sea level.

The geological formation of Wayne County is, with some minor modifications, essentially that of northeastern Ohio. Consequently there are absent all the series between the coal measures of the Carboniferous and the superincumbent Quaternary deposits; the Mesozoic and Tertiary being unrepresented. By reason of its position on the eastern slope of the axis of the anticlinal, Wayne County marks one of the western limits of the Ohio coal deposits. The coal measures are confined principally to the eastern half of the County, and where present rest either directly upon the sub carboniferous Waverly group, or upon the superincumbent sand conglomerate formation. Coal in paying quantities and of good quality is extensively mined in several of the eastern townships.

The Quaternary deposits consist largely of drift, and their clays, sands, gravels and boulders, overlying the rock strata to a depth of ten to eighty feet, constitute the major portion of the surface of the County. The rocks of the Carboniferous formation, both those of the Waverly group and those of the coal measures, consisting of sandstones, shales and limestones, are, however, exposed in numerous places throughout the County, and in suitable locations are to some extent quarried. Glacial action is evident over almost the entire area; and there are a number of buried stream channels, as well as the remains of the beds of several ancient lakes, more particular mention of which will be made in another connection.

The surface of the country is generally rolling, interspersed in some portions with elevations of considerable height, occasional deep valleys, and expanses of level lowland prairie.

The streams are numerous, though not of large size. The most important is the Killbuck, which rises in the northern part of the County, flows in a southerly direction entirely across the western portion, passing within a mile of Wooster, and in the continuance of its course beyond the limits of the County, finally discharges its waters into the Muskingum. The next in size is the Chippewa, which, however, flows through only the two northeastern townships, becoming in its extralimital course tributary to the Tuscarawas River. Newman's Creek, another tributary of the Tuscarawas, rises in the eastern portion of the County, and flows out in a northeasterly direction, draining the region known as Newman's Swamp. In the extreme western portion the Muddy Fork of the Mohican makes a wide circuit into the two central townships; while the southeastern portion of the County is drained by Sugar Creek and Salt Creek. Apple Creek is the main tributary of the Killbuck, and joins the latter near Wooster, its own branches flowing from the east and northeast. All these streams are fed by numerous smaller ones, some of which are, however, almost entirely dry during protracted absence of rain. The majority of the main streams are crooked creeks, with generally very sluggish currents and very low banks. The elevations and hills, which in many places slope back from the larger streams, apparently indicate by their evidences of erosion that the flowing water has cut down through them to the channels now occupied.

The few lakes are situated in the northeastern and southwestern parts of the County, the largest being Fox Lake, which lies only a short distance from the line of Stark County. Its water is clear and very deep, and it appears to be a favorite resort for both water birds and shore birds. All the other lakes are much smaller. Near the southwestern corner of the County, but just outside its boundaries, is situated a group of four or five lakes, two of which, Long Lake and Odell's Lake, are of considerable size. The northern extremity of the latter is said to be within the County. The character of these lakes is much the same as of those previously mentioned, the shores being partially or wholly marshy and covered in places with a thick growth of cat-tail flags (*Typha latifolia*) or yellow water lilies (*Nymphaea advena*); such vegetation forming the favorite summer home of the Least Bittern (*Ardetta exilis*). In suitable places in these lakes the white water lily (*Castalia odorata*) is found in abundance.

Bordering most of the streams of Wayne County are level low lands, which along the larger water courses are sometimes several miles in width. During seasons of heavy rainfall these bottom lands are overflowed, and when this occurs during the fall or early spring, Ducks and other water birds are much more than usually abundant. Many portions of these lands have been drained and are now under cultivation. There are here

also many damp, grassy meadows, some of them of wide extent, which are in spring and fall the feeding grounds of numerous Meadowlarks (*Sturnella magna*) and Killdeers (*Agialites vocifera*). Even at the present time large areas of forest still exist on some of these bottom-lands, though of course much has been cleared, and in many places there remains only a fringe of trees along the streams. The principal trees here are red maple (*Acer rubrum*) and elm (*Ulmus Americana*); together with which occur sycamore (*Platanus occidentalis*), black walnut (*Juglans nigra*), beech (*Fagus atropunicea*), white oak (*Quercus alba*), pin oak (*Quercus palustris*), sugar maple (*Acer Saccharum*), swamp hickory (*Hicoria minima*), slippery elm (*Ulmus pubescens*), and ash (*Fraxinus sp.?*). These bottom woods are, during the breeding season, frequented by such birds as the Red-shouldered Hawk (*Buteo lineatus*), Barred Owl (*Syrinum nebulosum*) and Crow (*Corvus americanus*). In the many dead tree trunks several species of Woodpeckers find homes, and the decaying stumps serve a like purpose for the benefit of the Chickadees (*Parus atricapillus*). Here also in the winter are found in greatest abundance all of the resident Woodpeckers; while the Brown Creeper (*Certhia familiaris americana*) and Winter Wren (*Troglodytes hiemalis*) seem to find in such localities the most congenial surroundings.

Throughout the lowlands of the Killbuck Valley in the southern half of the County are frequent swamps, some of them of considerable extent. They are always, except in the most extreme drought, overspread with water, and are either covered with cat-tail flags (*Typha latifolia*) and tall rank grass, or overgrown with dense thickets and low trees; in either case well-nigh inaccessible under ordinary circumstances. Here, as well as in the undergrowth along the streams, flourish alders, willows of several species, and other similar bushes; while the waste lands often surrounding them produce a luxuriant harvest of beggar-ticks (*Bidens frondosa*) and spanish needles (*Bidens bipinnata*).

These isolated bogs are the remains of what in the early part of the present century was an almost uninterrupted swamp, extending south from Wooster to beyond the limits of the County, and which, together with all the lowlands in the valley, was covered with water for many years after the advent of man to this region. This is evidently what was once the bed of a pre-glacial lake, the former existence of which is attested by the present topography of the locality.

In this ancient lake were islands whose identity is still preserved, their soil being of a conspicuously different consistency from that of the surrounding lake bed, over which has been spread thick deposits of sand, and of the vegetable mould which now constitutes the rich soil of these bottom-lands. In this respect these islands are scarcely different from the

high ground bordering the valley, and were originally well wooded with trees similar to those growing on the uplands. There are wide stretches of this lake bed, now designated as "prairies", which were formerly open water, but by their emergence became covered with a thick growth of vegetation, consisting of bushes, flags, rushes and rank grass. The portions of these prairies that remain at present uncleared are the favorite haunts of Rails and Snipes.

Newman's Swamp, extending east from Orrville six miles to the border of the County, is situated in the bed of another pre-glacial lake, and was in many respects the same as the swamp in the valley of the Killbuck, only if anything wilder and more impenetrable. This has now, however, to a great extent been cleared and put under cultivation. Areas of swamp and prairie, of an origin similar to those described, exist in still other localities, notably in the northeast about Fox Lake, and in the extreme southwestern portion of the County.

In places along the large streams are drift deposits, forming often extensive terraces skirting the bluffs which border the valleys—the city of Wooster itself being located upon ground of this character. Upon these terraces existed forests of deciduous trees, probably similar to those now growing upon the uplands. The uplands themselves are at length seen to be practically plateaux overlooking the lowlands in the valleys. Erosion is plainly visible in the numerous ravines and gullies which have been cut out where the brooks flow down to join the main streams.

These ravines are usually wooded, at least in part, containing in many places the only trees spared by the ruthless axe. Here are found such trees and shrubs as the following: buckeye (*Æsculus glabra*), wild cherry (*Prunus serotina*), elm (*Ulmus Americana*), red maple (*Acer rubrum*), black walnut (*Juglans nigra*), butternut (*Juglans cinerea*), tulip tree (*Liriodendron Tulipifera*), beech (*Fagus atropunicea*), oaks (*Quercus alba*, *rubra* et *valutina*), sassafras (*Sassafras Sassafras*), dogwood (*Cornus florida*), ironwood (*Ostrya Virginiana*), elder (*Sambucus Canadensis*), black haw (*Viburnum prunifolium*), and at least two species of thorn (*Crataegus*). In these ravines flourish the trilliums (*Trillium erectum et grandiflorum*), while in suitable places along the banks grow the dainty hepatica (*Hepatica Hepatica*) and the fragrant arbutus (*Epigæa repens*), although the latter is extremely local in its distribution. These shady retreats furnish congenial summer homes for such avian species as the Wood Thrush (*Turdus mustelinus*), Rose-breasted Grosbeak (*Habia ludoviciana*), Scarlet Tanager (*Piranga erythromelas*), Brown Thrasher (*Harporhynchus rufus*), and Catbird (*Galeoscoptes carolinensis*).

The uplands are interspersed with frequent woodland tracts, the major portion of the country, however, being under cultivation. The

numerous apple orchards and grass fields leave nothing to be desired by those birds which are accustomed to make such places their summer abodes. The forest areas consist often of heavy timber, many of the trees being from three to five feet in basal diameter, but from some of the woodland the larger trees have been removed, leaving only the smaller growth. The underbrush in these upland woods is rarely dense, and is often practically wanting. The trees are almost exclusively deciduous, the only conifers of consequence being the hemlock (*Tsuga Canadensis*), which occurs in a few localities on high banks along streams; and the red cedar (*Juniperus Virginiana*), scattered individuals of which are found in some parts of the County. The characteristic deciduous trees are: white oak (*Quercus alba*), red oak (*Quercus rubra*), black oak (*Quercus velutina*), pin oak (*Quercus palustris*), shell-bark hickory (*Hicoria ovata*), pig-nut hickory (*Hicoria glabra*), sugar maple (*Acer saccharum*), beech (*Fagus atropunicea*), basswood (*Tilia Americana*), chestnut (*Castanea dentata*), tulip tree (*Liriodendron Tulipifera*), with an occasional cucumber tree (*Magnolia acuminata*.)

With respect to climate this region presents few peculiarities. The temperature ranges from 20 degrees below to 99 degrees above zero Fahrenheit, though both these extremes are exceptional. Heavy frosts are not generally prevalent before October, and the severe cold weather usually occurs during the latter part of December and in January. The influence of winter, however, often extends far into the spring, and frosts in May are not infrequent. The fall of snow is not heavy; the greatest rainfall, as a rule, occurring in the spring months. This is usually succeeded either in the summer or early fall by a season of drought, which is sometimes of considerable duration. Severe thunder-showers are not uncommon, being most frequent during June and the first part of July. The average annual precipitation at Wooster, for the seven years previous to 1894, was 40.11 inches; the average annual temperature for the same period being 49.3 degrees Fahrenheit.

Faunally considered this locality is almost purely Carolinian, with a very slight infusion of forms of somewhat more northern affinities—as *Habia ludoviciana*, *Piranga erythromelas* and *Parus atricapillus*, which are all common during the breeding season. With these occur such characteristic Carolinian species as *Empidonax virescens*, *Icterus spurius*, *Spizella pusilla*, *Cardinalis cardinalis*, *Stelgidopteryx serripennis*, *Helminthophila pinus*, *Seiurus motacilla*, *Icteria virens* and *Thryothorus ludovicianus*.

During both seasons of migration, but more particularly in the spring, species, as well as to a less extent individuals, are remarkably numerous, following in their movements what appears to be a natural highway along the courses of the streams, which it will be noticed form the headwaters

of the Muskingum River. The valley of the Killbuck seems to be especially suitable, for during a favorable season the woodlands along this stream fairly teem with bird life. A certain locality, situated along the Killbuck and distant some four miles northwest from Wooster, apparently presents unusual attractions to the birds, besides being both an entomological and a botanical paradise. This appears to be accounted for by the great diversity of topographical conditions existing within a comparatively small area; since here are upland fields, thickets, forests, and wooded ravines closely adjacent to the swamps, marshes, meadows, damp woodlands and thickets of the Killbuck's valley.

To illustrate its attractiveness to the lover of birds, as well as to indicate what may be seen here during the spring season of migration, the following list is appended; consisting of eighty-four species observed on May 15, 1892, between the hours of 7:30 A. M. and 9:00 P. M., a large proportion having been noted in the vicinity of the locality just mentioned:

Ardetta exilis,
Ardea virescens,
Gallinago delicata,
Totanus solitarius,
Actitis macularia,
Ægialitis vocifera,
Colinus virginianus,
Bonasa umbellus,
Zenaidura macroura,
Accipiter cooperii,
Buteo borealis,
Buteo lineatus,
Falco sparverius,
Syrnium nebulosum,
Megascops asio,
Coccyzus americanus,
Coccyzus erythrophthalmus,
Ceryle alcyon,
Dryobates villosus,
Dryobates pubescens,
Sphyrapicus varius,
Melanerpes erythrocephalus,
Colaptes auratus,
Antrostomus vociferus,
Chordeiles virginianus,
Chætura pelagica,
Trochilus colubris,
Tyrannus tyrannus,
Myiarchus crinitus,
Sayornis phæbe,
Contopus virens,

Empidonax flaviventris,
Empidonax traillii,
Empidonax minimus,
Cyanocitta cristata,
Corvus americanus,
Dolichonyx oryzivorus,
Molothrus ater,
Agelaius phoeniceus,
Sturnella magna,
Icterus galbula,
Quiscalus quiscula æneus,
Spinus tristis,
Poocætes gramineus,
Zonotrichia leucophrys,
Zonotrichia albicollis,
Spicella socialis,
Melospiza fasciata,
Pipilo erythrophthalmus,
Cardinalis cardinalis,
Habia ludoviciana,
Passerina cyanea,
Piranga erythromelas,
Progne subis,
Chilidon erythrogastra,
Tachycineta bicolor,
Stelgidopteryx serripennis,
Vireo olivaceus,
Vireo gilvus,
Vireo flavifrons,
Mniotilta varia,
Helminthophila pinus,

<i>Dendroica aestiva</i> ,	<i>Thryothorus ludovicianus</i> ,
<i>Dendroica caerulescens</i> ,	<i>Troglodytes hiemalis</i> ,
<i>Dendroica maculosa</i> ,	<i>Sitta carolinensis</i> ,
<i>Dendroica pennsylvanica</i> ,	<i>Parus bicolor</i> ,
<i>Dendroica virens</i> ,	<i>Parus atricapillus</i> ,
<i>Seiurus aurocapillus</i> ,	<i>Regulus calendula</i> ,
<i>Seiurus motacilla</i> ,	<i>Poliophtila caerulea</i> ,
<i>Geothlypis trichas</i> ,	<i>Turdus mustelinus</i> ,
<i>Setophaga ruticilla</i> ,	<i>Turdus fuscescens</i> ,
<i>Galeoscoptes carolinensis</i> ,	<i>Merula migratoria</i> ,
<i>Harporhynchus rufus</i> ,	<i>Sialia sialis</i> .

The number of species actually ascertained to occur in the County is 183. Of this number thirty are permanent residents, as follows; those less common during the winter being designated by an asterisk:

<i>Colinus virginianus</i> ,	<i>Dryobates pubescens</i> ,
<i>Bonasa umbellus</i> ,	<i>Melanerpes carolinus</i> ,
<i>Zenaidura macroura</i> ,*	<i>Colaptes auratus</i> ,*
<i>Circus hudsonius</i> ,*	<i>Otocoris alpestris praticola</i> ,
<i>Accipiter velox</i> ,	<i>Cyanocitta cristata</i> ,
<i>Accipiter cooperii</i> ,	<i>Sturnella magna</i> ,*
<i>Buteo borealis</i> ,*	<i>Spinus tristis</i> ,
<i>Buteo lineatus</i> ,*	<i>Passer domesticus</i> ,
<i>Falco sparverius</i> ,*	<i>Melospiza fasciata</i> ,*
<i>Asio wilsonianus</i> ,	<i>Cardinalis cardinalis</i> ,
<i>Syrnium nebulosum</i> ,	<i>Ampelis cedrorum</i> ,*
<i>Nyctala acadica</i> ,	<i>Thryothorus ludovicianus</i> ,
<i>Megascops asio</i> ,	<i>Sitta carolinensis</i> ,
<i>Bubo virginianus</i> ,	<i>Parus bicolor</i> ,
<i>Dryobates villosus</i> ,	<i>Parus atricapillus</i> ,

The following sixty-one are summer residents, those distinguished by an asterisk being sometimes also winter residents:

<i>Aix sponsa</i> ,	<i>Chætura pelagica</i> ,
<i>Botaurus lentiginosus</i> ,	<i>Trochilus colubris</i> ,
<i>Ardetta exilis</i> ,	<i>Tyrannus tyrannus</i> ,
<i>Ardea herodias</i> ,	<i>Myiarchus cinerascens</i> ,
<i>Ardea virescens</i> ,	<i>Sayornis phoebe</i> ,
<i>Rallus elegans</i> ,	<i>Contopus virens</i> ,*
<i>Philohela minor</i> ,	<i>Empidonax virescens</i> ,
<i>Actitis macularia</i> ,	<i>Empidonax traillii</i> ,
<i>Ægialitis vocifera</i> ,	<i>Corvus americanus</i> ,*
<i>Coccyzus americanus</i> ,	<i>Dolichonyx oryzivorus</i> ,
<i>Ceryle alcyon</i> ,*	<i>Molothrus ater</i> ,
<i>Melanerpes erythrocephalus</i> ,*	<i>Agelaius phoeniceus</i> ,
<i>Anthus vociferus</i> ,	<i>Icterus spurius</i> ,
<i>Chordeiles virginianus</i> ,	<i>Icterus galbula</i> ,

Quiscalus quiscula seneus,*
Poocetes gramineus,
Ammodramus savannarum passerinus,
Spizella socialis,
Spizella pusilla,
Pipilo erythrophthalmus,
Habia ludoviciana,
Passerina cyanea,
Spiza americana,
Piranga erythromelas,
Progne subis,
Petrochelidon lunifrons,
Chelidon erythrogastra,
Stelgidopteryx serripennis,
Lanius ludovicianus excubitorides,
Vireo olivaceus,
Vireo gilvus,

Vireo flavifrons,
Mniotilta varia,
Helminthophila pinus,
Dendroica aestiva,
Seiurus aurocapillus,
Seiurus motacilla,
Geothlypis trichas,
Icteria virens,
Galeoscoptes carolinensis,
Harporhynchus rufus,
Troglodytes aëdon,
Cistothorus palustris,
Poliophtila cærulea,
Turdus mustelinus,
Merula migratoria,*
Sialia sialis.*

Six additional species which belong more properly with the transient visitors have been identified as occasional summer residents:

Anas boschas,
Totanus flavipes,
Sphyrapicus varius,

Tachycineta bicolor,
Dendroica pennsylvanica,
Setophaga ruticilla.

The transient visitors number fifty-seven, and are as follows:

Colymbus auritus,
Podilymbus podiceps,
Urinator imber,
Larus philadelphia,
Merganser americanus,
Lophodytes cucullatus,
Anas obscura,
Anas americana,
Anas carolinensis,
Anas discors,
Spatula clypeata,
Dafila acuta,
Aythya americana,
Aythya valisneria,
Aythya affinis,
Glaucionetta clangula americana,
Charitonetta albeola,
Eristamur rubida,
Branta canadensis,
Rallus virginianus,
Porzana carolina,
Gallinula galeata,

Fulica americana,
Gallinago delicata,
Tringa maculata,
Totanus melanoleucus,
Totanus solitarius,
Bartramia longicauda,
Coccyzus erythrophthalmus,
Empidonax flaviventris,
Empidonax minimus,
Scolecophagus carolinus,
Carpodacus purpureus,
Ammodramus sandwichensis savanna,
Zonotrichia leucophrys,
Zonotrichia albicollis,
Melospiza georgiana,
Passerella iliaca,
Helminthophila peregrina,
Dendroica tigrina,
Dendroica cærulescens,
Dendroica coronata,
Dendroica maculosa,
Dendroica cærulea,

<i>Dendroica castanea</i> ,	<i>Sitta canadensis</i> ,
<i>Dendroica striata</i> ,	<i>Regulus calendula</i> ,
<i>Dendroica blackburniæ</i> ,	<i>Turdus fuscescens</i> ,
<i>Dendroica virens</i> ,	<i>Turdus aliciae</i> ,
<i>Geothlypis agilis</i> ,	<i>Turdus ustulatus swainsonii</i> ,
<i>Geothlypis philadelphia</i> ,	<i>Turdus aonalaschke pallasii</i> .
<i>Sylvania pusilla</i> ,	

Nine species may be catalogued as winter visitors :

<i>Archibuteo lagopus sancti-johannis</i> ,	<i>Lanius borealis</i> ,
<i>Asio accipitrinus</i> ,	<i>Troglodytes hiemalis</i> ,
<i>Plectrophenax nivalis</i> ,	<i>Certhia familiaris americana</i> ,
<i>Spizella monticola</i> ,	<i>Regulus satrapa</i> .
<i>Junco hyemalis</i> ,	

Eighteen species are of only casual or accidental occurrence, as follows :

<i>Larus argentatus smithsonianus</i> ,	<i>Aquila chrysaetos</i> ,
<i>Pelecanus erythrorhynchos</i> ,	<i>Haliaeetus leucocephalus</i> ,
<i>Merganser serrator</i> ,	<i>Falco peregrinus anatum</i> ,
<i>Clangula hyemalis</i> ,	<i>Falco columbarius</i> ,
<i>Olor columbianus</i> ,	<i>Pandion haliaëtus carolinensis</i> ,
<i>Ardea egretta</i> ,	<i>Strix pratensis</i> ,
<i>Cathartes aura</i> ,	<i>Nyctea nyctea</i> ,
<i>Ectopistes migratorius</i> ,	<i>Otocoris alpestris</i> ,
<i>Buteo latissimus</i> ,	<i>Acanthis linaria</i> .

Two species which were undoubtedly once permanent residents of the County are now probably extinct, viz. :

<i>Meleagris gallopavo</i> ,	<i>Ceophloeus pileatus</i> .
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A census of the birds of the County according to families gives the following result :

Podicipidæ, 2 species,	Falconidæ, 13 species,
Urinatoridæ, 1 species,	Strigidæ, 1 species,
Laridæ, 2 species,	Bubonidæ, 7 species,
Pelecanidæ, 1 species,	Cuculidæ, 2 species,
Anatidæ, 20 species,	Alcedinidæ, 1 species,
Ardeidæ, 5 species,	Picidæ, 7 species,
Rallidæ, 5 species,	Caprimulgidæ, 2 species,
Scolopacidæ, 8 species,	Micropodidæ, 1 species,
Charadriidæ, 1 species,	Trochilidæ, 1 species,
Tetraonidæ, 2 species,	Tyrannidæ, 8 species,
Phasianidæ, 1 species,	Alaudidæ, 2 species,
Columbidæ, 2 species,	Corvidæ, 2 species,
Cathartidæ, 1 species,	Icteridæ, 8 species,

Fringillidæ, 22 species,
Tanagridæ, 1 species,
Hirundinidæ, 5 species,
Ampelidæ, 1 species,
Laniidæ, 2 species,
Vireonidæ, 3 species,

Mniotiltidæ, 22 species,
Troglodytidæ, 6 species,
Certhiidæ, 1 species,
Paridæ, 4 species,
Sylviidæ, 3 species,
Turdidæ, 7 species.

Total number of families, 38; of species, 183.

THE BIRDS OF WAYNE COUNTY.

ORDER PYGOPODES. DIVING BIRDS.

SUBORDER PODICIPEDES. GREBES.

FAMILY PODICIPIDÆ. GREBES.

GENUS **COLYMBUS**. LINNÆUS.

SUBGENUS **DYTES**. KAUP.

1. **Colymbus auritus** (LINN.).

Horned Grebe.

A more or less regular transient on the streams and ponds of the County. It is tolerably common in the fall, but it is not so frequently observed in the spring.

GENUS **PODILYMBUS** LESSON.

2. **Podilymbus podiceps** (LINN.).

Pied-billed Grebe; Dabchick; Hell Diver.

A common transient both in fall and spring, apparently occurring most numerous in April, September and October. A specimen in the writer's collection was taken on the Wooster Reservoir, September 30, 1892. Possibly a rare summer resident of the most secluded swamps and marshes, but there is no record of its breeding within the limits of the County.

SUBORDER CEPHI. LOONS AND AUKS.

FAMILY URINATORIDÆ. LOONS.

GENUS **URINATOR**. CUVIER.

3. **Urinator imber** (GUNN.).

Loon; Great Northern Diver.

Transient visitor; rare. Apparently most liable to be encountered after a severe spring storm, when occasionally one or two alight on Killbuck Creek. It is found sometimes also on the lakes and ponds, and even along the smaller streams. Seldom if ever have more than two been seen at one time. An adult in the collection of Mr. C. E. Bixler was taken in the central park of the County, May 2, 1893.

ORDER LONGIPENNES. LONG-WINGED SWIMMERS.

FAMILY LARIDÆ. GULLS AND TERNS.

SUBFAMILY LARINÆ. GULLS.

GENUS **LARUS**. LINNÆUS.4. **Larus argentatus smithsonianus** (COUES.).**American Herring Gull.**

Very rare transient visitor. Appearing irregularly on ponds and the larger streams, generally singly or in pairs. A fine adult specimen in the collection of Mr. John Blandford, of Wooster, was shot near the town, from a flock of four, in the spring of 1873.

5. **Larus philadelphia** (ORD).**Bonaparte's Gull.**

A rare and irregular transient visitor; noted most frequently in the spring. Individuals sometimes linger for several days along Killbuck Creek, or in the vicinity of the lakes and larger ponds. In the spring of 1879, four were seen and one shot on a mill pond near Wooster.

ORDER STEGANOPODES. TOTIPALMATE SWIMMERS.

FAMILY PELECANIDÆ. PELICANS.

GENUS **PELECANUS**. LINNÆUS.SUBGENUS **CYRTOPELICANUS**. REICHENBACH.6. **Pelecanus erythrorhynchos** (GMEL.).**American White Pelican.**

Only a single specimen is known to have been taken. This is an adult in breeding plumage, and was shot in the summer of 1886, along Killbuck Creek in the southern portion of the County. No others were seen at the time. This bird was preserved and mounted for Dr. J. C. McMurray, of Shreve, from whom the above particulars of its capture were obtained. Dr. J. M. Wheaton mentions¹ but one specimen in breeding plumage as having been taken in the State.

¹ Geological survey of Ohio IV, 1882, p. 142.

ORDER ANSERES. LAMELLIROSTRAL SWIMMERS.

FAMILY ANATIDÆ. DUCKS, GEESE AND SWANS.

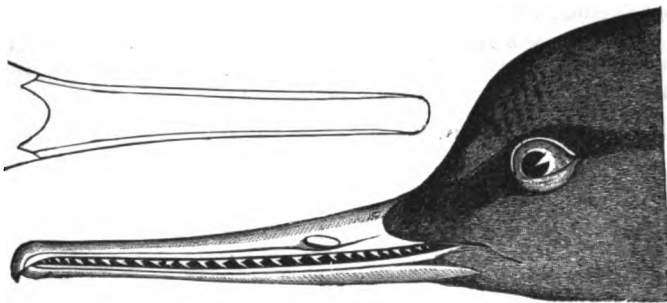
SUBFAMILY MERGINÆ. MERGANSERS.

GENUS **MERGANSER.** BRISSON.

7. **Merganser americanus** (CASS.).

American Merganser ; Goosander.

A rare transient visitor. A female in the collection of Mr. Joseph Housekeeper, of Wooster, was killed by him along Killbuck Creek, March 22, 1893.



RED-BREASTED MERGANSER, NATURAL SIZE.

8. **Merganser serrator** (LINN.).

Red-breasted Merganser.

This is in this locality apparently the rarest of the three species of Mergansers. The writer's only record for the County is that of an adult female obtained at the Wooster reservoir, November 15, 1890.

GENUS **LOPHODYTES.** REICHENBACH.

9. **Lophodytes cucullatus** (LINN.).

Hooded Merganser.

Transient visitor; of more frequent occurrence than either of the two preceding, though not very common. It is observed principally in the spring; males appearing to be oftener taken than females.

SUBFAMILY ANATINÆ. RIVER DUCKS.

GENUS **ANAS**. LINNÆUS.SUBGENUS **ANAS**.10. **Anas boschas** (LINN.).**Mallard.**

An abundant spring and fall transient. As is the case with several of the other Ducks that are found chiefly on the larger streams and bodies of water, this species is much more numerous during a very rainy season, the bottom-lands along the Killbuck being then extensively overflowed. The floods are more frequent in spring than in the fall; consequently the Ducks are at the former season decidedly more abundant. During a favorable autumn the Mallard is nearly as numerous as in spring, but if the fall be very dry, few or none are to be found. It occurs in spring chiefly in flocks, which in former years sometimes aggregated several thousand individuals; but at the present time flocks of over 150 are unusual. This diminution in numbers is due to the straightening of the course of Killbuck Creek, causing the water to recede from the flooded lands with comparative rapidity.

Mr. Housekeeper informs me that several years ago a nest of this species was found three miles south of Wooster, in an extensive marsh along the Killbuck. This is the only known instance of its breeding in the County.

11. **Anas obscura** (GMEL.).**Black Duck ; Dusky Duck.**

A common transient both in spring and fall; often in flocks associated with Mallards.

SUBGENUS **MARECA**. STEPHENS.12. **Anas americana** (GMEL.).**Badpate ; American Widgeon.**

A common transient visitor in spring, but rare in the fall. It is found principally along Killbuck Creek, not infrequently in large flocks, and often with Mallards and Black Ducks.

SUBGENUS **NETTION**. KAUP.13. **Anas carolinensis** (GMEL.).**Green-winged Teal.**

Transient visitor; tolerably common in the spring, but rare in autumn. It occurs in small flocks, alone or with other Ducks. It was formerly more common, and was found in much larger flocks.

SUBGENUS **QUERQUEDULA.** STEPHENS.**14. *Anas discors* (LINN.).****Blue-winged Teal.**

A tolerably common spring transient; not so often observed in the fall. It is seen in small flocks, frequently with other Ducks.

GENUS **SPATULA.** BOIE.**15. *Spatula clypeata* (LINN.).****Shoveller.**

A rare and irregular transient visitor. It is said to have been several times taken at Fox Lake. An adult male in full spring plumage, which was shot in the southern part of the County along Killbuck Creek, during the spring of 1886, is now in the collection of Mr. George Faber, of Wooster.

GENUS **DAFILA.** STEPHENS.**16. *Dafila acuta* (LINN.).****Pintail.**

An abundant transient in March and April; not nearly so numerous in the fall. It prefers the larger streams, especially Killbuck Creek, and when the adjacent lowlands are widely overflowed sometimes congregates there in flocks of 100 to 150 individuals. This species and the Mallard are of all the Ducks the most abundant.

GENUS **AIX.** BOIE.

WOOD DUCK, MUCH REDUCED.

17. *Aix sponsa* (LINN.).**Wood Duck; Summer Duck.**

Summer resident; tolerably common in some portions of the County, but in others, though formerly of regular occurrence, is now quite rare. It arrives usually during the latter part of March, or early in April, and may be found breeding in cer-

tain localities nearly every year. Its favorite haunts are the woods and swamps in the valley of the Killbuck, where in autumn, after a suitable season, flocks of twenty or thirty are sometimes to be seen. It remains until October or November.

SUBFAMILY FULIGULINÆ. SEA DUCKS.

GENUS **AYTHYA**. BOIE.

SUBGENUS **AYTHYA**.

18. **Aythya americana** (EVT.)

Redhead.

Now a rare transient visitor, although common many years ago, appearing regularly in spring in flocks along Killbuck Creek.

SUBGENUS **ARISTONETTA**. BAIRD.¹

19. **Aythya vallisneria** (WILS.)

Canvas-back.

Transient visitor; rare. It is seen singly or in pairs, sometimes with other species of Ducks, and chiefly on Killbuck Creek.

SUBGENUS **FULIGULA**. STEPHENS.

20. **Aythya affinis** (EVT.).

Lesser Scaup Duck; Raft Duck.

A common spring and fall transient, though never seen in large flocks. One of the first Ducks to appear in the spring, and among the latest to depart in autumn. It associates at times with Mallards, Pintails and Baldpates.

GENUS **GLAUCIONETTA**. STEJNEGER.

21. **Glaucionetta clangula americana** (BONAP.).

American Golden-eye.

A tolerably common though irregular spring transient; not observed in the fall. Apparently of most frequent occurrence in March, when it is often found on the smaller streams and ponds. An adult male in the collection of Mr. John Blandford was shot near Wooster, from a flock of four, in the spring of 1877. Another specimen, a female, in the writer's collection, was taken in the same vicinity on March 29, 1893.

¹This subgenus was unintentionally omitted from the A. O. U. Check List. (Cf RIDGWAY, Manual of North American Birds, p. 102.)

GENUS **CHARITONETTA.** STEJNEGER.22. **Charitonetta albeola** (LINN.).

Buffle-head; Butter-ball.

A common transient visitor in March and April; much less frequently observed in the fall. It occurs singly and in small flocks, usually not accompanied by other species. Contrary to the experience of Dr. Wheaton,¹ it here apparently prefers the lakes and ponds to running water; this being possibly due to the comparatively small size of the streams.

Mr. C. E. Bixler has a female of this species now mounted, which was picked up, evidently much exhausted, on one of the main streets of Wooster, April 26, 1885.

GENUS **OLANGULA.** LEACH.23. **Olangula hyemalis** (LINN.).

Old Squaw.

A winter visitor only, and apparently quite rare. The single known Wayne County record is that of an adult male which was killed during the winter of 1886-7, in the extreme southwestern portion of the County, on Odell's Lake, by men who were there at work cutting ice. This specimen is in the collection of Dr. J. C. McMurray, who furnished the above particulars of its capture.

GENUS **ERISMATURA.** BONAPARTE.24. **Erismatura rubida** (WILS.).

Buddy Duck.

A tolerably common transient on streams and ponds. Observed principally in the spring.

SUBFAMILY **ANSERINÆ.** GEESE.GENUS **BRANTA.** SCOPOLI.25. **Branta canadensis** (LINN.).

Canada Goose.

A common spring and fall transient, observed chiefly in March and November. The flocks not infrequently alight within the County, probably for the purpose of feeding. A farmer in Clinton township found, on the morning of March 21, 1894, about fifty of these birds in his yard among his domestic geese. A Canada Goose now in the collection of Mr. George Faber is said to have been found one morning, in an alley of Wooster, alive but in an exhausted condition.

¹ Geological survey of Ohio IV, 1882, p. 534.

SUBFAMILY CYGNINÆ. SWANS.

GENUS **OLOR.** WAGLER.**26. Olor columbianus** (ORD).**Whistling Swan.**

A rare transient visitor. A fine adult specimen, now mounted and in the possession of Dr. J. H. Todd of Wooster, was shot from a flock of thirteen, at the northern end of Odell's Lake, November 12, 1892.

ORDER HERODIONES. HERONS, STORKS, IBISES, ETC.

SUBORDER HERODII. HERONS, EGRETS, BITTERNS, ETC.

FAMILY ARDEIDÆ. HERONS, BITTERNS, ETC.

SUBFAMILY BOTAURINÆ. BITTERNS.

GENUS **BOTAURUS.** HERMANN.**27. Botaurus lentiginosus** (MONTAG.).**American Bittern.**

A rare summer resident; sometimes tolerably common during the spring. It is apparently restricted to the more extensive swamps and marshes on the bottom lands, and to the vicinity of the larger bodies of water.

GENUS **ARDETTA.** GRAY.**28. Ardetta exilis** (GMEL.).**Least Bittern.**

A tolerably common summer resident; somewhat more numerous and more generally distributed during the spring migration. In the latter season it is occasionally observed along streams or ditches on the bottom-lands. In summer it is apparently confined to the ponds and lakes and to the secluded swamps. It was found to be not uncommon at Round and Long Lakes, in Holmes County, just south of the Wayne County line, on July 27, 1893. It undoubtedly breeds, though no nests have come to the notice of the writer.

Several years ago a Least Bittern was found dead on one of the streets of Wooster, the bird having been killed by flying against the telegraph wires.

SUBFAMILY ARDEINÆ. HERONS AND EGRETS.

GENUS **ARDEA**. LINN.

SUBGENUS **ARDEA**.



GREAT BLUE HERON MUCH REDUCED.

29. Ardea herodias (LINN.).

Great Blue Heron.

A tolerably common summer resident; found in all suitable localities throughout the County. It is said to breed regularly in the vicinity of Orrville, though much less abundantly than in former years. At the present time the few pairs that at last report were annually rearing their young in the deep woods about three miles from the town are the only survivors of a once extensive heronry. This is probably owing

to the encroachments of cultivation, and it is quite possible that none now resort to the locality. No information in regard to other nesting places is at present available. Adults appear to be much less numerous than immature birds.

SUBGENUS **HERODIAS.** BOIE.

30. *Ardea egretta* (Gmel.).

American Egret.

A rare and irregular visitor. It occurs singly or in small flocks along streams and about the lakes and ponds, in spring, summer and early autumn. It appears to be more frequently reported in spring than at any other season. Dr. J. M. Wheaton says of this species,¹ "I have no record of its occurrence in spring or in the breeding season." Dr. B. H. Warren also mentions² this bird as a straggler in late summer and autumn only.

SUBGENUS **BUTORIDES.** BLYTH.

31. *Ardea virescens* (Linn.).

Green Heron.

A common summer resident from April 23, to October 1. It nests in orchards or in low trees along the streams, but rarely, if ever, in colonies. When molested it will ordinarily build a second and even a third nest, often not far from the site of the first. Five eggs is the usual complement here and full sets have been obtained from May 18 to June 12.

A peculiar trait in the half fledged young, and one which seems not to have been mentioned except by Audubon,³ is the manner in which, upon the close approach of anyone to the nest, some or all of the brood leave it, walk cautiously out nearly to the extremity of the supporting branch, and there remain squawking loudly at every move made in their direction. At these times the parent birds are very frequently not seen, apparently considering their offspring capable of taking care of themselves.

The measurements of five nests are as follows:⁴

No.	Height	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	8.00	8.00	9.00 x 7.00	.....	18.00 x 12.00	.....	9.00 x 6.00	5.00 x 1.50
2.....	6.00	2.50	6.00 x 5.00	.....	15.00 x 12.00	.....	8.00 x 6.00	.....
3.....	5.00	3.00	8.00 x 6.50	6.00 x 4.50	13.00 x 12.00	15.00 x 12.00	7.00 x 5.50	3.00 x 1.00
4.....	6.00	2.00	.....	.....	21.00 x 15.00	.....	.....	.....
5.....	5.00	2.50	6.00 x 5.00	.....	15.00 x 15.00	.....	.....	.....
Average..	6.00	2.60	7.25 x 5.88	.....	16.40 x 13.20	.....	8.00 x 5.83	4.00 x 1.25

¹ Geological Survey of Ohio IV, 1882, p. 501.

² Report on Birds of Pennsylvania, 1890, p. 59.

³ Ornithological Biography IV, 1838, p. 275.

⁴ All nest measurements are given in inches and hundredths; and the double dimensions which appear under single headings indicated maximum and minimum respectively.

ORDER PALUDICOLÆ. CRANES, RAILS, ETC.

SUBORDER RALLI. RAILS, GALLINULES, COOTS, ETC.

FAMILY RALLIDÆ. RAILS, GALLINULES AND COOTS.

SUBFAMILY RALLINÆ. RAILS.

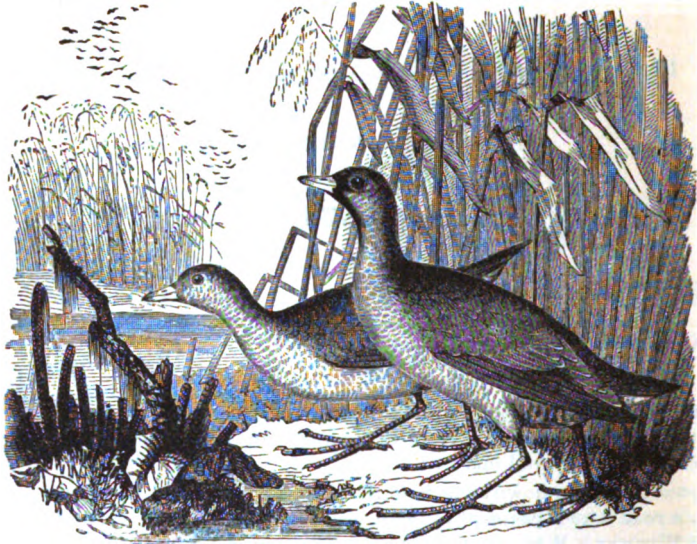
GENUS **RALLUS**. LINNÆUS.**32. *Rallus elegans* (AUD.).****King Rail.**

A rare summer resident from March to September; slightly more common in the spring than at other seasons. It is to be found principally in its breeding places in the extensive swamps and marshes.

A young bird in downy black plumage was captured in the latter part of June, 1888, on a road which passes through a swampy district about two and one-half miles south of Wooster. When first discovered, the parent bird (which was also secured), manifested much anxiety for the safety of its offspring, running again and again around the young one as though hoping thus to preserve it from harm. Both are now in the collection of Mr. J. Housekeeper.

33. *Rallus virginianus* (LINN.).**Virginia Rail.**

An abundant spring transient, chiefly in April; much less numerous in the fall. At these seasons it may be found in nearly all the large swamps and marshes of the County. Not ascertained to occur as a summer resident, perhaps from lack of opportunity for thorough investigation during that season, in localities suitable for the nesting of the species since it without much doubt breeds at least sparingly somewhere in this region.

GENUS **PORZANA.** VIEILLOT.SUBGENUS **PORZANA.**

SORA, MUCH REDUCED.

34. **Porzana carolina** (LINN.).

Sora; Carolina Rail.

An abundant transient in March and April; less common during its fall migration, which covers the latter part of August and the months of September and October. It has not been observed in summer, although it perhaps occurs. It is more numerous than either of the two preceding species, and frequents of course similar localities.

SUBFAMILY **GALLINULINÆ.** GALLINULES.GENUS **GALLINULA.** BRISSON.35. **Gallinula galeata** (LICHT.).

Florida Gallinule.

Rare; seen chiefly on the lakes and ponds, singly or in pairs. An adult female was captured alive in a barnyard eight miles north of Wooster, April 19, 1890, and was brought to town in a cage; but it lived only three days. It is now preserved in the writer's collection.

SUBFAMILY FULICINÆ. COOTS.

GENUS **FULICA**. LINNÆUS.**36. Fulica americana** (GMEL.).**American Coot.**

A common spring transient, often in flocks; not so numerous in the fall. It has been observed, though rarely, on some of the lakes as late as June, from which it would appear to be possibly a summer resident.

On April 9, 1887, Mr. C. E. Bixler found, in Wooster, a Coot that had evidently been killed by striking against the side of the low building near which it was discovered.

ORDER LIMICOLÆ. SHORE BIRDS.

FAMILY SCOLOPACIDÆ. SNIPES, SANDPIPERS, ETC.

GENUS **PHILOHELA**. GRAY.**37. Philohela minor** (GMEL.).**American Woodcock.**

Summer resident; tolerably common. It is generally distributed throughout the County, but is now in certain localities becoming rare. It appears in March; and migrates southward usually during the month of October, though occasionally a few may be found in favorable places as late as November.

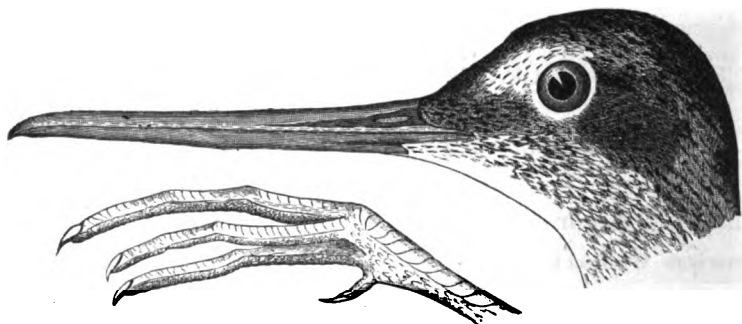
It begins to breed soon after its arrival. On May 24, 1891, a brood of three young about a week old were surprised in a little open place among thickets along a mill-race. While the parent bird endeavored to attract attention to herself, the young birds proceeded to quickly secrete themselves. They all started away in different directions holding their wings in a perpendicular position, and uttering at the same time a peculiar peeping note. One caught and held in the hand for a few moments still continued its peeping, and when placed again upon the ground immediately sought safety in concealment among the undergrowth.

GENUS **GALLINAGO**. LEACH.**38. Gallinago delicata** (ORD).**Wilson's Snipe.**

A common spring and fall transient; more numerous in the former season. It arrives generally about the middle of March (rather earlier than later), and is present in greatest numbers during the first three weeks of April; though somewhat irregular both in numbers and distribution. Individuals have sometimes been seen as late as May 15. Its favorite haunts are the marshes and damp meadows of the bottom lands.

GENUS **TRINGA**. LINNÆUS.SUBGENUS **ACTODROMAS**. KAUP.**39. Tringa maculata** (VIEILL.).**Pectoral Sandpiper.**

Transient visitor; observed only in the vicinity of Orrville, where it is common during April, in the marshy meadows bordering the uncleared portions of Newman's Swamp. It is found usually in flocks of not more than twenty individuals; and is ordinarily quite tame and unsuspicious. It has not been noted in the fall. In Mr. Freeman's collection are several specimens of this species, and to him the writer is indebted for the above facts in regard to its occurrence.

GENUS **TOTANUS**. BECHSTEIN.SUBGENUS **GLOTTIS**. KOCH.

GREATER YELLOW-LEGS, NATURAL SIZE.

40. Totanus melanoleucus (GMEL.).**Greater Yellow-legs.**

A rare transient visitor; occurring more frequently in the fall than in the spring. A specimen was taken at the Wooster Reservoir, October 14. 1890.

41. Totanus flavipes (GMEL.).**Yellow-legs.**

Transient visitor; rare; probably an occasional summer resident. One was shot by Mr. E. N. Freeman, near Orrville, in the summer of 1889.

SUBGENUS **HELODROMAS**. KAUP.**42. Totanus solitarius** (WILS.).**Solitary Sandpiper.**

A transient visitor; tolerably common in spring from the latter part of April to about the middle of May. The earliest date of its appearance is April 23 (1893) and none have been met with later than May 31. It generally occurs singly or in pairs,

but sometimes in companies of four or five, and frequents the vicinity of ditches, sluggish streams and stagnant pools. It has not been observed in the fall.

GENUS. **BARTRAMIA.** LESSON.

43. **Bartramia longicauda** (BECHST.).

Bartramian Sandpiper; Upland Plover.

A rare transient visitor; seen chiefly on the lowlands in the vicinity of water. One shot in the spring of 1891, at Newman's Swamp, is in the collection of Dr. E. B. Yager, of Orrville.

GENUS **ACTITIS.** ILLIGER.

44. **Actitis macularia** (LINN.).

Spotted Sandpiper.

Common summer resident from about the middle of April to the latter part of September. Extreme dates are April 13 and September 23. It frequents the lakes, ponds and streams of running water, breeding in the grass fields and the grain fieldst adjoining, or at most not far away. It is ordinarily to be found singly or in pairs, but sometimes in flocks of five to ten individuals.

FAMILY **CHARADRIIDÆ.** PLOVERS.

GENUS **ÆGIALITIS.** BOIE.

SUBGENUS **OXYECHUS.** REICHENBACH.

45. **Ægialitis vocifera** (LINN.).

Killdeer.

An abundant summer resident; noted from February 23 to November 30, though usually few remain later than November 1. It prefers as feeding grounds, especially in spring, the moist and even marshy meadows, although it may regularly be found in the upland fields. It frequently collects in small flocks before the breeding season but occurs in much larger companies during the latter part of the summer and in autumn. At Wooster, on July 11, 1892, a Killdeer apparently flying over the city at considerable altitude, was heard calling at 11:30 P. M.

The stomachs of two Killdeers examined contained red-legged grasshoppers (*Melanoplus femur-rubrum*), and scarabæid beetles (*Aphodius servil*), with remains of unidentifiable *Staphilinidæ* and *Curculionidæ*.¹

A killdeer shot November 10, 1892, along the margin of a small stream near Wooster is remarkable for the condition of one of its feet. The right tarsus of this specimen is very much shriveled below an enlargement of the bone near the ankle joint, this enlargement having the appearance of an old shot wound. By reason of this the tarsus and middle toe are together seven-eighths of an inch shorter than in the other foot. This apparently rendered the limb useless, for the bird, though able to

¹ Insect determinations are by Prof. F. M. Webster.

fly perfectly well, walked with much evident difficulty. The left tibia of another specimen, taken October 12, 1892, was found to be very crooked, and at a point near its proximal extremity so much enlarged as to indicate either a former fracture or similar severe injury. It had, however, completely healed, and the bone to all appearances was as strong as it had ever been.

ORDER GALLINÆ GALLINACEOUS BIRDS.

SUBORDER PHASIANI. PHEASANTS, GROUSE, PARTRIDGES, QUAILS, ETC.

FAMILY TETRAONIDÆ. GROUSE, PARTRIDGES, ETC.

SUBFAMILY PERDICINÆ. PARTRIDGES.

GENUS **COLINUS**. LESSON.

46. **Colinus virginianus** (LINN.).

Bob-white ; "Quail."

A permanent resident; some years abundant much less numerous during others. In severe winters whole covies are sometimes found dead, having succumbed to cold and the scarcity of proper food. It is, moreover, not an infrequent circumstance to discover individuals that have been killed by flying against wires of the telegraph lines.

Except during part of the breeding season this species moves chiefly in flocks, frequenting preferably thickets, fence rows, patches of high weeds and similar places. It breeds generally in the fields, though occasionally in thickets on the edge of woodland; constructing sometimes a domed nest. The breeding season begins in May, and some years continues until September; a young bird just from the nest having been taken by Mr. C. E. Bixler on September 5, 1887. Two or three broods are probably reared.

SUBFAMILY TETRAONINÆ. GROUSE.

GENUS **BONASA**. STEPHENS.

47. **Bonasa umbellus** (LINN.).

Ruffed Grouse ; Pheasant.

A permanent resident; tolerably common in some portions of the County, but rare in others. It was formerly abundant throughout all of this region, but during recent years has steadily diminished in numbers, coincident with the removal of the forests. It affects chiefly the more extensive woodlands, apparently preferring those portions with thick undergrowth, though it is at times seen even in small tracts of timber which afford little or no concealment. The males may be heard drumming from April to October.

On June 9, 1891, a family of fourteen downy young was surprised in thick woods. The parent bird, without manifesting the usual solicitude for the safety of its young, flew away into the forest, being neither again seen nor heard; thus for the time being apparently deserting her brood. The young, which were all huddled close together, immediately began to separate, and though closely watched, they were in less than one minute all effectually hidden.

FAMILY PHASIANIDÆ. PHEASANTS, ETC.

SUBFAMILY MELEAGRINÆ. TURKEYS.

GENUS **MELEAGRIS** LINNÆUS.

48. **Meleagris gallopavo** (LINN.).

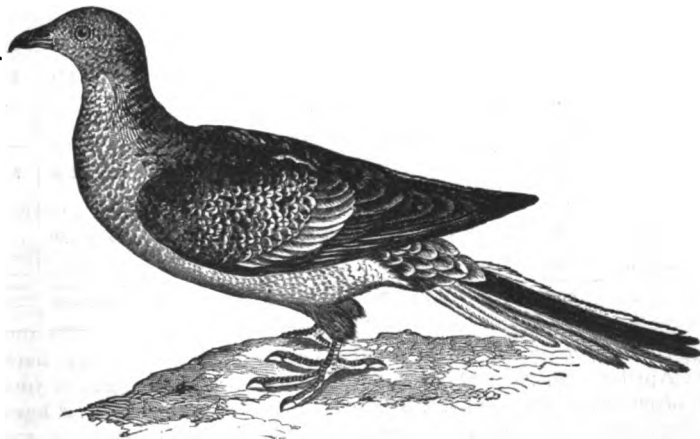
Wild Turkey.

Formerly a resident, breeding in suitable situations throughout the County. It was common until about 1865, since which time until 1878 it gradually became of less frequent occurrence. The last authentic date of its appearance in Wayne County seems to be December 31, 1878. On that day a scattered company of six was seen by Mr. Joseph Housekeeper, in the swampy thickets on the bottom-lands four miles south of Wooster; the birds having been first discovered by their tracks in the snow. From the condition of the ground it was evident that they had been in the vicinity for several days. They were followed by other hunters also, but were exceedingly wary, and only a single bird of the flock was finally secured.

ORDER COLUMBÆ. PIGEONS.

FAMILY COLUMBIDÆ. PIGEONS.

GENUS **ECTOPISTES** SWAINSON.



PASSENGER PIGEON, MUCH REDUCED.

49. *Ectopistes migratorius* (LINN.).**Passenger Pigeon.**

This species is said to have been an abundant summer resident thirty years ago, at that time there having been a large roost in Newnan's Swamp. By the clearing of large portions of the swamp the Pigeons were driven away, but until about 1873 single pairs were to be found breeding in the vicinity of Orrville. During the past twenty years the species has been of only casual occurrence, the most recent dates of capture being September 19, 1888, and August 30, 1892; both of single birds.

GENUS *ZENAIDURA* BONAPARTE.**50. *Zenaidura macroura* (LINN.).****Mourning Dove.**

An abundant summer resident; remaining in part over winter according to the severity of the weather, being probably even in severe seasons to be found in sufficiently sheltered localities. It moves more or less in at least small flocks at all times of the year, but in fall and winter seldom to any extent otherwise. Four Mourning Doves were observed April 23, 1893, feeding in a meadow among a flock of domestic pigeons. The same four individuals were subsequently seen upon the ground in the midst of a flock of Red-winged Blackbirds.

This species begins nest-building early in April, and the breeding season continues at its height until June. The nest is placed almost anywhere; in trees or bushes, on stumps, rail fences, but only occasionally on the ground. Of fifty nests examined, only two were more than fifteen feet from the ground, while three-fourths of the whole number were not at a greater altitude than ten feet. An old Robin's nest is occasionally utilized as a foundation; and a Mourning Dove's nest was noted May 22, 1892, built upon the abandoned domicile of a Brown Thrasher.

The measurements of eight nests are as follows:

No.	Height	Depth.	Inside top diameter	Outside top diameter.	Outside middle diameter	Outside bottom diameter.	Width of rim.
1	8.50	1.00	3.00 x 3.00	6.00 x 5.00	.....	.....	1.00 x 0.75
2	8.00	1.00	3.00 x 2.50	6.00 x 5.00	3.50 x 3.50	5.00 x 5.00	2.00 x 0.75
3	2.50	0.75	2.5 x 2.50	6.00 x 5.00	.....	.....	2.00 x 0.75
4	4.00	1.00	3.00 x 3.00	7.00 x 6.00	.....	.....	.....
5	5.00	1.00	3.60 x 3.00	7.00 x 5.75	5.00 x 5.00	2.00 x 2.00	3.00 x 0.25
6	2.00	1.00	2.75 x 2.25	6.00 x 5.00	.....	.....	.....
7	3.50	2.00	3.50 x 3.00	9.00 x 6.00	6.00 x 4.25	5.00 x 3.00	.....
8	3.50	1.20	3.50 x 3.00	7.00 x 6.50	7.00 x 4.50	8.00 x 4.50	.....
Average	3.33	1. 8	3.14 x 2.78	6.6 x 5.53	5.38 x 4.31	5.00 x 3.68	2.00 x 0.63

Two eggs constitute of course the usual complement, but three eggs have twice been found: April 27, 1890, and May 14, 1893. If the nest contain eggs or young the parent bird often in her actions betrays great solicitude for the safety of her household, fluttering along on or near the ground for a considerable distance in the endeavor to attract to herself the attention of the real or supposed intruder.

ORDER RAPTORES. BIRDS OF PREY.

SUBORDER SARCORHAMPHI. AMERICAN VULTURES.

FAMILY CATHARTIDÆ. AMERICAN VULTURES.

GENUS **CATHARTES** ILLIGER.**51. Cathartes aura** (LINN.).**Turkey Vulture.**

A rare summer visitor, although apparently common in Holmes County, only a short distance farther south. It is seen in Wayne County generally singly or in pairs; and on several different occasions individuals have been taken, some of which are now preserved as mounted specimens.

SUBORDER FALCONES. VULTURES, FALCONS, HAWKS, ETC.

FAMILY FALCONIDÆ. VULTURES, FALCONS, HAWKS, ETC.

SUBFAMILY ACCIPITRINÆ. KITES, BUZZARDS, HAWKS, ETC.

GENUS **CIRCUS** LACÉPÈDE.**52. Circus hudsonius** (LINN.).**Marsh Hawk.**

Resident; common in spring and fall, but less frequently observed at other seasons. It is found on upland as well as on the bottoms, though apparently preferring the latter as its hunting grounds. A nest of this species was discovered by Mr. E. N. Freeman, near Orrville, in the spring of 1891. It was on the ground in a meadow, and was a very slight affair. It contained six eggs.

GENUS **ACCIPITER** BRISSON.SUBGENUS **ACCIPITER**.**53. Accipiter velox** (WILS.).**Sharp-shinned Hawk.**

A tolerably common resident; apparently of most frequent occurrence on the bottom-lands. It ventures occasionally into the towns, particularly in winter. On January 9, 1893, one made its appearance about the court-house at Wooster, in pursuit of the numerous House Sparrows that find a refuge in the nooks and corners of the building. On February 1, another Sharp-shinned Hawk, or possibly the same individual, was seen at the same place. Although no nests of this species have been found it undoubtedly breeds in the County.



COOPER'S HAWK, ABOUT ONE-THIRD NATURAL SIZE.

54. *Accipiter cooperii* (BONAP.).

Cooper's Hawk.

A common resident; oftener observed in spring than at any other season. In the winter it retreats to the most sheltered portions of the woods, preferably to the vicinity of evergreens, where such are available, and seldom during the severe season venturing far abroad.

Although this species has not actually been found breeding in the County, young unable to fly have been captured by Mr. Freeman.

On March 18, 1891, there was discovered on the ground in a sheltered situation among evergreens, an immature female Cooper's Hawk, which was from some cause other than a wound so weak that it was unable to fly or even to make more than the most feeble efforts to escape.

GENUS **BUTEO** CUVIER.**55. Buteo borealis** (GMEL.).**Red-tailed Hawk.**

A common summer resident; much less numerous in winter. It breeds chiefly on the uplands, in heavy timber, though not infrequently near the edge of the woods in the vicinity of a human habitation or a well travelled road. The tree chosen appears to be generally a white oak (*Quercus alba*); though nests have been found in the pin oak (*Quercus palustris*); chestnut (*Castanea dentata*) and beech (*Fagus atropunicea*). The distance of the nest from the ground varies from sixty to ninety feet, but is generally between seventy and eighty-five feet. Old nests are frequently reoccupied, but not usually in successive seasons.

The measurements of the nest of this species given by Major Chas. E. Bendire¹ are apparently too small, unless these Ohio nests are exceptionally large. This discrepancy is especially noticeable in the depth of the inner cavity, as may be seen by reference to the dimensions of the following seven nests, measured *in situ*:

No.	Height	Depth	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.
1.....	15.00	7.50	15.00 x 14.00	8.00 x 8.00	36.00 x 36.00	26.00 x 26.00	14.00 x 14.00
2.....	18.00	6.00	13.00 x 13.00	.....	33.00 x 27.00	.....	.....
3.....	26.00	5.00	9.00 x 9.00	6.00 x 6.00	43.00 x 24.00	33.00 x 24.00	30.00 x 18.00
4.....	18.00	4.50	12.00 x 12.00	9.00 x 9.00	36.00 x 17.00	30.00 x 12.00	14.00 x 8.00
5.....	18.00	4.00	10.00 x 9.00	7.00 x 6.00	42.00 x 21.00	30.00 x 15.00	9.00 x 6.00
6.....	15.00	6.00	12.00 x 12.00	.....	36.00 x 24.00	.....	.....
7.....	36.00	7.00	10.00 x 8.00	6.00 x 6.00	48.00 x 30.00	42.00 x 30.00	18.00 x 12.00
Average.....	20.86	5.71	11.57 x 11.00	7.23 x 7.00	39.14 x 25.57	32.20 x 21.40	17.00 x 11.60

The eggs are usually deposited during the latter half of March, but sometimes as late as the middle of April. Two or three eggs constitute a complement, the former number being somewhat the more common.

On April 21, 1891, in response to a vigorous rap upon a tall oak, a female Red-tail left her nest with such apparent haste and carelessness that she pushed out of the nest one of the young birds, which came crashing down through the branches to the ground, being of course killed by the fall. This young bird was only two or three days old, but its stomach was packed with remains of meadow mice (*Microtus pennsylvanicus*). In this locality, there being an abundance of other food, the Red-tailed Hawk seldom lays tribute upon the poultry yards.

56. Buteo lineatus (GMEL.).**Red-shouldered Hawk.**

An abundant resident, but much less often seen during the winter than at any other season. It is in this region more numerous than any other Hawk, and for comparison with the Sparrow and Red-tailed Hawks, which rank next in abundance,

¹ Life Histories of North American Birds I, 1892, p. 210.

the total number of each observed in 1892 may be taken as a fair criterion. These figures are: Red-shouldered Hawk, 87; Sparrow Hawk, 37; Red-tailed Hawk, 27.

The Red-shouldered Hawk prefers the wooded bottom-lands; and while there is scarcely a tract of lowland woods of any considerable size which is not inhabited by one or even two pairs of *Buteo lineatus*, yet during the spring and summer it remains so closely within its haunts, that were these places not visited, the species might very readily be considered much less abundant than is really the case. In parts of the County where no bottom-lands exist, the Red shouldered Hawk is apparently less numerous, though by no means rare.

The eggs, according to the writer's experience, are in this locality somewhat more commonly four than three in number. They are deposited generally between the fifth and the twentieth of April, the variation in different seasons being apparently not dependent upon the mildness or severity of the weather. Young in the nest have been observed as early as May 5. Eggs unmarked, or nearly so, occasionally occur, although these are somewhat the exception. Eggs in different stages of incubation are not infrequently found in the same nest.

This species, like the Red-tailed Hawk, manifests little inclination to defend its nest against a human intruder, but usually contents itself with retreating into the woods, or at most soaring about high overhead. In fact the writer has record of but a single instance where on the part of the parent bird any fierceness was exhibited. On this occasion, the female, after being driven from the nest only when the latter was nearly reached in climbing, persisted in making repeated and most vicious swoops at the disturber of her peace, until forced to desist by the approach below of someone with a gun. This nest contained one young bird just hatched, together with three eggs in which incubation was nearly completed. Under ordinary circumstances the female leaves the nest while the tree is being approached, but sometimes, especially if incubation be advanced, she is with considerable difficulty dislodged.

Of the nest of the Red-shouldered Hawk, the dimensions given by Major Chas. E. Bendire¹ are, as in the case of the preceding species, somewhat too small, unless these Ohio nests are to be considered exceptional. The measurements of ten nests are as follows:

No.	Height	Depth	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	18.00	4.00	8.00 x 7.00	6.50 x 6.00	30.00 x 24.00	33.00 x 24.00	24.00 x 21.00	.....
2.....	28.00	8.00	10.00 x 7.00	7.00 x 5.00	24.00 x 18.00	30.00 x 18.00	18.00 x 12.00	.....
3.....	18.00	4.00	11.00 x 10.00	.....	33.00 x 27.00	27.00 x 18.00	26.00 x 12.00	.....
4.....	21.00	5.00	8.50 x 7.00	6.75 x 6.00	26.00 x 18.00	24.00 x 12.00	18.00 x 5.00	.....
5.....	22.00	4.00	7.50 x 7.50	6.00 x 5.50	24.00 x 22.00	31.00 x 28.00	24.00 x 12.00	.....
6.....	12.00	8.00	6.50 x 6.50	5.50 x 5.00	30.00 x 18.00	30.00 x 18.00	30.00 x 18.00	15.00 x 3.50
7.....	18.00	3.00	7.50 x 6.50	6.50 x 5.50	29.00 x 22.00	29.00 x 22.00	15.00 x 12.00	12.00 x 5.50
8.....	27.00	6.00	6.50 x 5.50	6.50 x 5.50	28.00 x 26.00	36.00 x 24.00	.....	.....
9.....	18.00	5.00	14.00 x 11.00	.....	33.00 x 24.00	33.00 x 24.00	18.00 x 12.00	.....
10.....	21.00	6.00	9.00 x 8.00	7.00 x 6.50	30.00 x 19.00	33.00 x 14.00	27.00 x 7.00	.....
Average...	20.30	4.30	8.85 x 7.60	6.47 x 5.63	28.70 x 21.80	30.60 x 20.20	22.22 x 12.33	.....

From a comparison of the above measurements with those of the nest of *Buteo borealis* it will be seen that while the nest of the latter is considerably greater in diameter, it is very little higher than the nest of *B. lineatus*, but has nevertheless a

¹ Life Histories of North American Birds I, 1892, p. 221.

somewhat deeper inner cavity. According to the writer's observation, the nest of *B. borealis* is, moreover, on the average much better finished inside, very frequently being lined with a quantity of grapevine bark closely matted together; while on the other hand some nests of *Buteo lineatus* are merely loose collections of sticks and twigs, with very little lining, and so nearly flat that the eggs seem in danger of being thrown from the nest.

The elm (*Ulmus Americana*) seems to be most frequently chosen as a site for the nest, but the following trees have been observed also thus utilized, viz.: maples (*Acer rubrum et Saccharum*), beech (*Fagus atropunicea*), walnut (*Juglans nigra*), oak (*Quercus alba*) and ash (*Fraxinus sp.?*).

In this locality the same nest appears to be seldom occupied two years in succession, even though the birds be not disturbed. Wherever the nest of a Red-shouldered Hawk is found, a nest of the Crow is reasonably certain to be situated in the immediate vicinity, a circumstance not observed in connection with any other species of Raptores, and which, considering the apparent animosity existing between the two species in question, is perhaps not easily explained.

In a nest from which eggs were taken April 24, 1892, there was noticed a small quantity of the claws and shells of crustaceans, probably the remains of a recent meal.

Two young Red-shouldered Hawks taken from the nest when about four weeks old, were, after a confinement of two months and a half, killed to serve as specimens. The stomach of one of these birds was found to be distended to its utmost capacity by a compact mass of excelsior packing, with which the floor of the cage had been covered. This indigestible material had evidently been taken into the stomach by having adhered to the food eaten, but how the bird would have disposed of the mass might be interesting to have determined.

57. *Buteo latissimus* (WILS.).

Broad-winged Hawk.

Rare; probably a summer resident. Only two records are at present available: that of an adult shot on the grounds of the State Agricultural Experiment Station at Wooster, July 4, 1893; and one seen about six miles north of this place on July 9 of the same year.

GENUS *ARCHIBUTEO* BREHM

58. *Archibuteo lagopus sancti-johannis* (GMEL.).

American Rough-legged Hawk.

A rare winter visitor. It has been observed usually during the months of March and April, and seldom anywhere excepting on the bottom-lands. It has not been noted later than April.

GENUS *AQUILA* BRISSON.

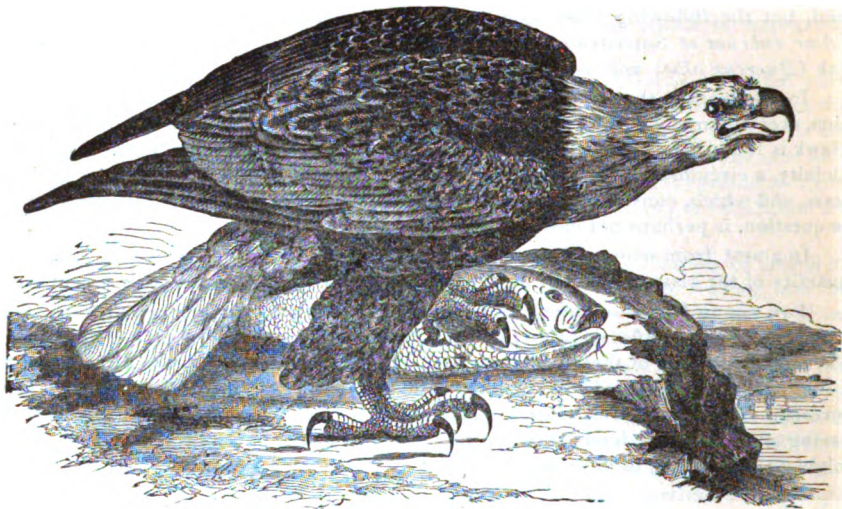
59. *Aquila chrysaetos* (LINN.).

Golden Eagle.

A rare and irregular winter visitor. The most recent, and so far as the writer is aware, the only authentic date of its capture within the borders of the County, is

November 10, 1891. This bird, an immature male in fine plumage, was killed in a wooded ravine near the southern boundary of the County by a farmer resident in the vicinity.¹

GENUS **HALIÆTUS** SAVIGNY.



BALD EAGLE, GREATLY REDUCED.

60. **Haliæetus leucocephalus** (LINN.).

Bald Eagle.

Undoubtedly in former years of more frequent occurrence, but at the present time it is only an occasional visitor. A specimen in the collection of Mr. House-keeper was taken not far from Wooster, about the year 1886. The large Hawks, and sometimes even the Turkey Vulture, are here not seldom mistaken for the present species; and an investigation of most of the tales of "eagles" seen, has proven them to be similar misidentifications.

SUBFAMILY **FALCONINÆ**. FALCONS.

GENUS **FALCO** LINNÆUS

SUBGENUS **RHYNCHODON** NITZSCH.

61. **Falco peregrinus anatum** (BONAP.).

Duck Hawk.

Very rare; a single specimen in the collection of Mr. E. N. Freeman is the only one known to have been taken in the County. This bird, a very fine adult, was secured early in the autumn of 1895, along a creek in the vicinity of Orrville. When first

¹ Auk 1X, 1892, p. 200.

observed it was engaged in pursuing Mourning Doves, which were there quite numerous; its method being to remain quietly perched on a limb until one came within range, then giving chase, sometimes for a long distance. The Doves, however, being swift of flight, almost invariably succeeded in finally eluding their pursuer, for if too closely pressed, they would, while in full flight, suddenly close their wings and drop as if shot into the dense underbrush, whither of course the Hawk would not follow.

SUBGENUS *ÆSALON* KAUP.

62. *Falco columbarius* (LINN.).

Pigeon Hawk.

Apparently rare; added to the list on the strength of a single mounted specimen in the collection of Prof. S. S. Milligan, of Wooster. In regard to this specimen there are unfortunately no data available, beyond the mere fact of its having been shot in the vicinity of the town. A Hawk seen October 16, 1891, on the bottom-lands along the Killbuck, was probably of this species, though its identity was not positively determined.

SUBGENUS *TINNUNCULUS* VIEILLOT.

63. *Falco sparverius* (LINN.).

American Sparrow Hawk.

Abundant; with the exception of *Buteo lineatus* the most numerous Hawk. It is resident, excepting perhaps in very severe winters, but is always more frequent in spring and summer than at other seasons, the migrant portion returning north during the latter part of February or early in March.

Nidification takes place in April, and the young are hatched usually about the third week in May. The situation chosen for the nest is either a natural cavity or an old Woodpecker's excavation, usually from thirty-five to sixty-five feet from the ground. It is commonly in the dead top of a living tree, though sometimes in a tree wholly dead and even tottering from decay.

A Sparrow Hawk was captured November 9, 1893, in the building of the Wooster High School, where it had apparently flown for shelter. A bird of this species was observed on April 3, 1894, to pick up and fly away with a snake fully eighteen inches in length, and so heavy as to be with evident difficulty carried.

SUBFAMILY PANDIONINÆ. OSPREYS.

GENUS *PANDION* SAVIGNY.

64. *Pandion haliaetus carolinensis* (GMEL.).

American Osprey; Fish Hawk.

A rare summer visitor; perhaps in former years more common. It has occasionally been seen singly or in pairs, fishing on the larger bodies of water, but is not at the present time of regular occurrence.

SUBORDER STRIGES. OWLS.

FAMILY STRIGIDÆ. BARN OWLS.

GENUS **STRIX** LINNÆUS.**65. *Strix pratincta* (BONAP.).****American Barn Owl.**

Rare; observed only in winter. A specimen in the collection of the writer was shot by a farmer near Wooster, February 2, 1892. Another specimen now in the possession of Mr. George Faber, and obtained during the same winter, about two miles from where the other bird was killed, is much paler, the ground color of the plumage being almost white. These two are the only individuals known to have been taken in the County.

Although there are more or less numerous instances of the occurrence of this species in Michigan, Indiana, northern Pennsylvania, southern Ontario and southern Ohio, the only other published records for the last named State north of Columbus seem to be as follows: (1) Prof. A. J. Cook,¹ on the authority of Mr. E. L. Moseley, speaks of the Barn Owl as "common at Sandusky;" (2) Mr. A. Hall² mentions one taken at East Rockport near Cleveland; and (3) Mr. Carl Tuttle³ records the capture of a single specimen in Erie County.

FAMILY BUBONIDÆ. HORNED OWLS, ETC.

GENUS **ASIO** BRISSON.**66. *Asio wilsonianus* (LESS.).****American Long-eared Owl.**

A rare summer resident; tolerably common in fall and winter, though not generally so numerous as the next species. The only record of summer capture is a single specimen taken near Orrville in 1887, by Mr. Ellsworth N. Freeman, under circumstances which would suggest its having nested in the vicinity.

67. *Asio accipitrinus* (PALL.).**Short-eared Owl; Meadow Owl.**

A common winter visitor; occurring singly, in pairs, or in small flocks. While it is perhaps a rare summer resident, the writer has no record of its presence during that season. The extensive meadows and swamps on the lowlands form its favorite hunting grounds, though it is found also on the uplands. On account of its low soaring flight when flushed by day it is an easy mark for hunters and the gun of the small boy, many being thus killed every winter. Stomachs of specimens examined contained only meadow mice (*Microtus pennsylvanicus*).

¹ Birds of Michigan, Edition I 1833, p. 67.

² Forest and Stream XXVI, 1885, p. 446.

³ Auk XII, 1895, p. 191.

GENUS **SYRNIUM** SAVIGNY.**68. *Syrnium nebulosum* (FORST.).****Barred Owl.**

A common resident; frequents chiefly the wooded swamps and lowlands, in which localities it breeds.

On May 9, 1893, the writer obtained from a nest in the hollow top of the trunk of a huge beech, two young of this species, which were apparently about three and a half weeks old. From some unknown cause, one of them died a few days later, but the other was kept in confinement for more than a year. It was allowed the freedom of a small poultry house, the glass sides of which seemed to be to it a continual enigma. Nearly always when its abode was entered it would fly against the glass, only of course to fall to the ground. Its favorite perch was an old wire cage upon which were several boards so placed that they slanted upwards to about five feet above the ground, and on the highest part of this the Owl spent most of its time. Though not at all vicious, it nevertheless resented any familiarity, and vigorously protested against being touched. Its food consisted principally of raw beef, of which it consumed about six ounces per day. It was, however, quite fastidious as to diet and would touch no spoiled meat unless absolutely obliged by hunger. A Pied-billed Grebe in the incipient stages of decomposition, though offered to the Owl after a three days' fast, was reluctantly tasted, and only a portion of the neck eaten. Boiled meat was evidently not relished, being persistently refused.

GENUS **NYCTALA** BREHM.**69. *Nyctala acadica* (GMEL.).****Saw-whet Owl.**

A rare resident; rather more frequently met with during the winter than at other seasons. Mr. E. N. Freeman states that it is sometimes not uncommon in winter in the vicinity of Orrville; and its nocturnal habits may to some extent account for its apparent rarity in other parts of the County. The capture of a summer specimen by the same gentleman indicates the probability of its nidification here, but actual proof of the same has not been obtained.

GENUS **MEGASCOPS** KAUP.**70. *Megascops asio* (LINN.).****Screech Owl.**

Resident; the most common of the Owls. Almost every large tract of woodland shelters at least one pair, and the species may also be frequently found about the farm-houses, as well as on the outskirts of the towns.

Just at dusk on August 25, 1890, in a tract of bottom woodland, the writer wounded a Screech Owl with a charge of dust shot. It fell, but caught with its feet a limb and there clung until dislodged by a stick, when with wings spread it sailed down and took refuge in a partially decayed stump. Although seen to enter the stump, a close search of fully fifteen minutes was necessary to discover its hiding place. So closely had it pressed itself into a cavity in the wood that remaining motionless, and aided by its peculiar coloration, it was overlooked at least half a dozen times, though in plain sight all the while.

The stomach of a specimen examined contained remains of the white-footed mouse (*Peromyscus leucopus*), and of an unidentifiable Sparrow.

Of twenty-eight specimens from the County, fourteen are gray, thirteen are in the red phase, and one is in the rarer intermediate plumage. This last specimen has the general color of the upper parts mummy brown, the principal color markings below being reddish brown.

GENUS **BUBO** DUMÉRIL.



GREAT HORNED OWL, MUCH REDUCED.

71. Bubo virginianus (GMEL.).

Great Horned Owl.

A tolerably common resident; apparently most numerous during the fall and winter, being found in nearly all wooded districts of the County. It is here generally regarded as injurious, and is consequently killed whenever occasion offers. It is not infrequently captured alive, and is perhaps thus taken oftener than any other Owl.

GENUS **NYCTEA** STEPHENS.

SNOWY OWL. GREATLY REDUCED.

72. Nyctea Nyctea (LINN.).**Snowy Owl.**

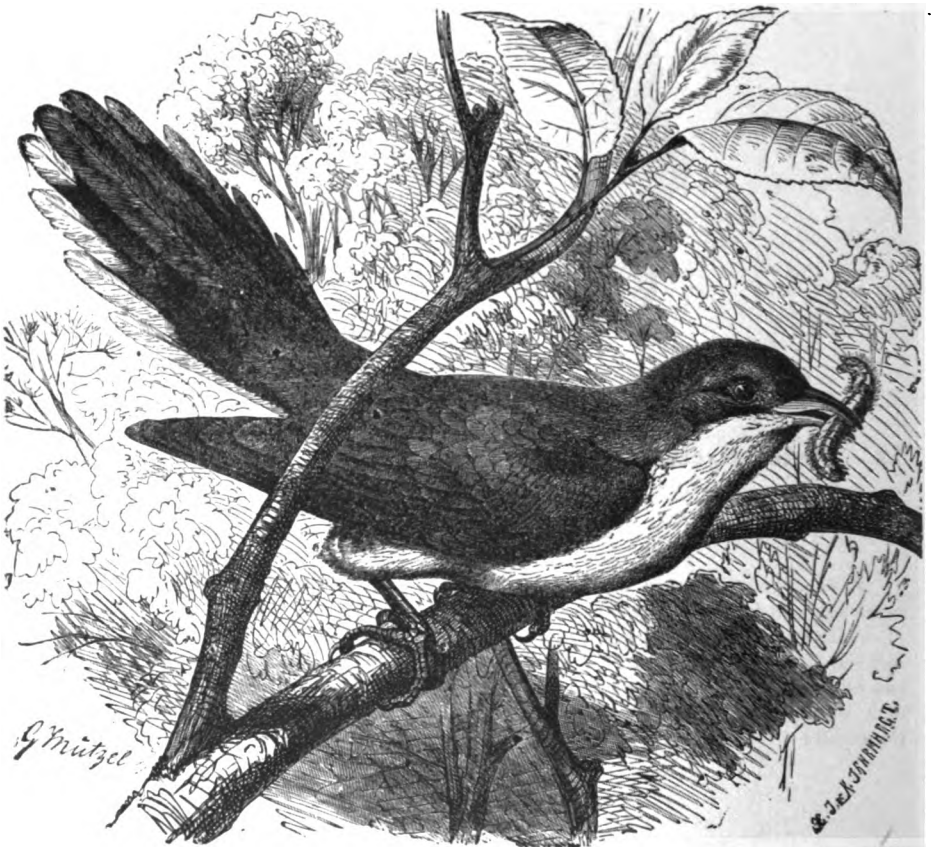
A rare and irregular winter visitor. One caught near Wooster a number of years ago was for several months maintained in confinement, its chief diet consisting of raw liver. A fine adult specimen now in the possession of Mr. J. Blandford, was secured in the northern part of the County, in January, 1878. There are records of two others taken during the same winter, one of which was shot at night from the top of a chimney in Wooster. This specimen is now in the museum of Wooster University.

ORDER COCCYGES. CUCKOOS, ETC.

SUBORDER CUCULI. CUCKOOS, ETC.

FAMILY CUCULIDÆ. CUCKOOS, ANIS, ETC.

SUBFAMILY COCCYGINÆ. AMERICAN CUCKOOS.

GENUS **COCCYZUS** VIFFLOT.

YELLOW-BILLED CUCKOO, ONE-HALF NATURAL SIZE.

73. *Coccyzus americanus* (LINN.).**Yellow-billed Cuckoo.**

A common summer resident. It appears in May, the tenth of this month being the earliest date; and though ordinarily not much observed after the middle of September, has been noted as late as October 19, (1892).

It frequents principally the woods, thickets and orchards, breeding usually in one of the two last named localities. Three or four eggs constitute in this vicinity the normal complement. The breeding season continues commonly from the first of June to the middle of July, but the following exceptional dates have been noted. A nest containing four perfectly fresh eggs was discovered on August 17, 1890; and on September 13 of the same year, another nest containing two unincubated eggs was found not over forty feet from the one taken a month before.

Four nests measure respectively as follows :

No.	Height.	Depth	Inside top diameter.	Inside middle diameter.	Outside top diameter	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.	4.00	1.75	3.50 x 3.75	3.0 x 3.00	6.50 x 6.00	5.50 x 5.50	5.00 x 3.00	2.00 x 0.50
2.	5.50	1.50	3.50 x 3.00	2.75 x 2.50	8.00 x 6.00	7.50 x 5.50	3.50 x 3.50	3.00 x 0.50
3.	8.00	1.50	3.25 x 3.25	3.00 x 2.50	8.00 x 5.00	6.50 x 4.00	5.00 x 2.75	2.50 x 0.38
4.	3.50	1.00	3.50 x 3.50	.....	8.00 x 8.00	.....	.....	.....
Average..	4.00	1.44	3.44 x 3.75	2.92 x 2.00	7.63 x 6.25	6.50 x 5.00	4.50 x 3.08	2.50 x 0.46

On June 10, 1891, a Yellow-billed Cuckoo was found dead upon the front porch of a house on the outskirts of Wooster. Appearances indicated that the bird had been killed by flying against the door, as examination revealed the absence of any wound, and dissection showed it to be apparently in healthy condition.

The peculiar notes of this species are occasionally heard at night.

74 *Coccyzus erythrophthalmus* (WILS.).

Black-billed Cuckoo

A transient visitor; sometimes tolerably common in the spring, but apparently rare in autumn. From the fact that this species is so common a summer resident in parts of the State, it may seem strange that it should not be so listed in this locality, but the most careful search has failed to reveal its presence, except from May 9 to 22, and on September 27, 1891. Future investigations may perhaps show it to be present during the breeding season.

SUBORDER ALCYONES. KINGFISHERS.

FAMILY ALCEDINIDÆ. KINGFISHERS.

GENUS *CERYLE* BOIE.

SUBGENUS *STREPTOCERYLE* BONAPARTE.

75. *Ceryle alcyon* (LINN.).

Belted Kingfisher.

A common summer resident; occurring along all the larger streams. It arrives from the south in March; remaining until by the freezing of the watercourses in the

fall it is unable to obtain its food. During open winters a few usually remain throughout the entire season. It is ordinarily not seen far from water, and for nesting purposes it selects the bank of a stream. The eggs are deposited usually before the middle of May, and are, when the complement is complete, six or seven in number. Occupied nests have been observed from May 17 to June 15; that on the former date containing eggs one-fourth incubated, that on the latter five fully feathered young. The young in this nest were ranged in a row across the chamber at the inner extremity of the burrow, and were crowded close together, all facing the entrance, thus from without presenting quite an odd appearance. The burrow is usually three or four feet in length, sometimes straight, but generally diverted horizontally at a greater or less angle.

The measurements of four nests result as follows:

No.	Total length of burrow.	Diameter of burrow.	Length of chamber.	Width of chamber.	Height of chamber.
1.....	49.00	4.00 x 3.00	18.0	12.00	5.00
2.....	56.00	3.50 x 3.00	10.00	8.75	6.00
3.....	41.00	4.00 x 3.50	6.75	12.00	7.00
4.....	57.00	3.25 x 3.00	9.00	11.00	6.00
Average	50.50	3.69 x 3.13	9.60	10.94	6.00

In all the nests that have been examined, the eggs were deposited in the enlargement at the extremity of the passage, upon a quantity of fish bones, fish scales, and sometimes remains of crustaceans. The Kingfisher's habit of constructing its nest of twigs, grass, feathers, etc., mentioned by Wilson, Gentry and some other writers, seems to be the exception rather than the rule, or at least to a considerable degree a local occurrence.

Madame *Ceryle* is, when sitting, difficult to dislodge from her nest, and snaps viciously at anything that comes within her reach. A lighted match fastened to the end of a stick and thrust into the nest is invariably picked at until extinguished. She usually remains while the digging out of the nest is in progress, attempting to escape only as the chamber containing the eggs is neared, sometimes even then refusing to leave until removed by force.

ORDER PICI. WOODPECKERS, WRYNECKS, ETC.

FAMILY PICIDÆ. WOODPECKERS.

GENUS *DRYOBATES* BOIE.

76 *Dryobates villosus* (LINN.).

Hairy Woodpecker.

A common resident; more numerous in fall and winter than at other seasons. There is in this locality apparently a remarkable predominance of females, since out of a series of fourteen specimens, taken principally during fall and winter, only three are

males; and this ratio seems to be fairly constant so far as observation of living birds can determine. The favorite haunts of this species are, in fall and winter, the woods of the bottom-lands, but where such places are not available it frequents fully as numerous the upland forests; being of regular occurrence throughout the County. It is not uncommonly found along fencerows in the open country, in thickets, or even orchards, but is scarcely ever to be seen in the towns, except during the late fall and winter months. Both this and the following species have at times been noticed to repeatedly perch on limbs crosswise, after the manner of Sparrows or other passerine birds.

The Hairy Woodpecker breeds generally in the most secluded portions of the forests. A nest found May 3, 1891, in moist woodland along Killbuck Creek, was in the solid living wood of a swamp hickory, (*Hickoria minima*). It contained young about two-thirds fledged.



DOWNY WOODPECKER, NATURAL SIZE.

77. *Dryobates pubescens* (LINN.).

Downy Woodpecker; "Sapsucker."

An abundant resident, though apparently less common in spring and summer than at other seasons. It occurs everywhere, but seems to affect most numerous, especially in winter, the woods of the bottom-lands. At that season it is frequently found associated with the following species: *Certhia familiaris americana*, *Sitta carolinensis*, *Parus bicolor*, *Parus atricapillus*, *Regulus satrapa*, and *Dryobates villosus*.

Like the last species, the Downy Woodpecker is not often seen in the towns, except during the fall and winter months. It breeds usually in May, exhibiting as to locality a decided preference for the woods on the bottoms, where such lands exist, although it sometimes nests in orchards.

Most authors mention the complement of eggs deposited by the Downy Woodpecker as from four to six; of a larger number the only record that the present writer has been able to discover being by Worthington,¹ who secured one set of seven eggs. A set also of seven was collected by the writer near Wooster, May 22, 1891. The nest was situated in a tract of woods on the swampy lowlands along Killbuck Creek. It was excavated twenty-four feet from the ground in the outer (or under) side of the remaining stub of a dead limb. It was much narrowed towards the bottom,

¹ Ornithologist and Oölogist VI, 1881, p. 43.

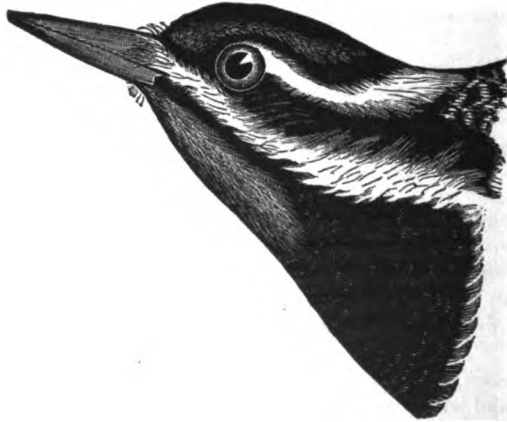
apparently to avoid breaking into an abandoned Woodpecker's excavation from which even then it was separated by only a very thin partition. Its dimensions are given herewith:

Depth from entrance.	Diameter of entrance.	Diameter at top.	Diameter at entrance.	Diameter at bottom.
6.00	1.26	3.00 x 2.50	3.50 x 3.25	3.50 x 2.00

The eggs from this nest exhibit a remarkable difference in size, as will be seen from the following measurements (in inches), viz.: .81 x .65, .80 x .63, .77 x .63, .77 x .62, .71 x .59, .67 x .53, .55 x .49. They were all in varying stages of incubation; the four largest being approximately one-half incubated; the fifth in size, about one-fourth; and the two smallest nearly fresh. This variation in the incubation of eggs in the same nest has been, in the case of *Dryobates pubescens*, observed by the writer in also another instance, but so far at least as may be inferred from the accounts of the nesting of the species published by other observers, it does not seem to be a common occurrence. Both sexes assist in the duties of incubation.

Specimens of the Downy Woodpecker, as well as of some other birds from this locality, are frequently found to have the plumage of the under parts much soiled from contact with the bark of the trees.

GENUS **SPHRYAPICUS** BAIRD.



YELLOW-BELLIED SAPSUCKER, NATURAL SIZE.

78. **Sphrapicus varius** (LINN.).

Yellow-bellied Sapsucker.

A common spring transient, but apparently rare in autumn. It is not usually observed in winter, but a specimen was taken by Mr. W. E. Henderson, near Wooster, January 1, 1890. It appears generally between the second and eighth of April, and commonly disappears before the middle of May. It has been noticed in fall only twice: September 27, 1891, and October, 2, 1892. It seems in this locality to prefer the bottom woodlands, where it is sometimes seen in company with other Woodpeckers.

On July 12, 1891, the writer discovered in a wooded ravine near Wooster, four immature birds of this species, which had without reasonable doubt been reared in the immediate vicinity. An adult was also on the same date seen in a neighboring orchard. This is apparently the first definite record of the breeding of the species in Ohio, although Wheaton mentions¹ having observed in May a pair of these birds at work upon a nest which was subsequently deserted.

In spring the drumming of the Yellow-bellied Sapsucker may usually be easily recognized by the following peculiarities. Four or five taps given in quick succession are followed by a short pause, this being soon succeeded by two short quick taps; then another pause, and two more taps in somewhat less rapid succession than the first; followed by yet another pause, and two additional taps still a little slower. This is sometimes slightly varied with regard to the number of taps; and occasionally also the latter part consists only of single quick taps with an increasing interval toward the last. The two most common forms may be crudely represented as follows:

----- -- -- -- and ----- -- -- --

GENUS **CEOPHLÆUS** CABANIS.

79. **Ceophlæus pileatus** (LINN.).

Pileated Woodpecker.

This was formerly a common species in the heavily timbered lands throughout most of the County, but with the clearing of the extensive forests it gradually disappeared, having been very rare for the past twenty-five or thirty years. Mr. Joseph Housekeeper informs me that the last specimen taken in the County, so far as he is aware, was shot about 1883.

GENUS **MELANERPES** SWAINSON.

SUBGENUS **MELANERPES.**

80. **Melanerpes erythrocephalus** (LINN.).

Red-headed Woodpecker.

An abundant summer resident from the last of March until October; a few sometimes remain during mild winters. It frequents forests, orchards and fields, nesting in almost any suitable situation. The dead top of any large tree, or any apple tree with a large dead limb, is pretty sure to sooner or later contain the nest of a Red-headed Woodpecker. The first mentioned situation is often tenanted by both this species and the Flicker, the nests being sometimes in the same limb, and within a few feet of each other. But in even this close proximity the birds live in apparently perfect harmony.

The breeding season continues usually from about the middle of May until the first of July, being at its height during the last week in May and the first week of June. The number of eggs is usually four or five, not often six. They are sometimes found to be in varying stages of incubation. The nests which have been observed ranged from twelve to seventy feet from the ground.

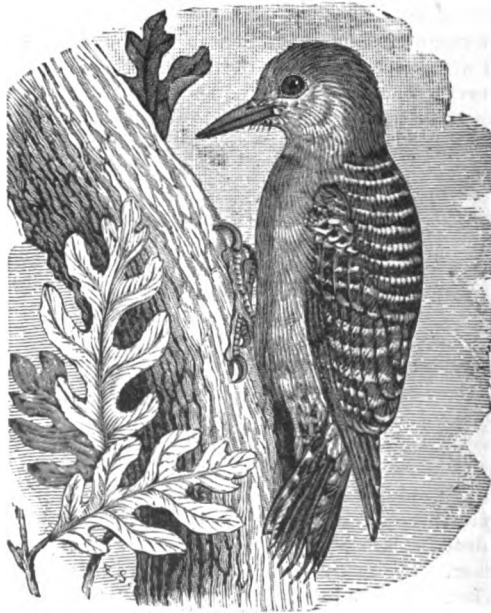
¹Geological Survey of Ohio IV, 1882, p. 399.

The measurements obtained from four nests are herewith given :

No.	Total depth.	Diameter of entrance.	Diameter at entrance.	Diameter at middle.	Diameter at bottom.
1	10.00	2.25 x 2.18	4.00 x 2.25	4.00 x 4.00	4.68 x 3.50
2	10.50	1.75 x 1.63	4.00 x 2.00	4.00 x 4.00	4.50 x 4.00
3	11.00	2.00 x 1.38	3.50 x 3.00	5.00 x 3.50	4.00 x 2.50
4	11.50	2.25 x 1.50	3.75 x 3.50	5.00 x 4.00	4.50 x 3.38
Average	10.75	2.06 x 1.66	3.81 x 2.69	4.50 x 3.88	4.41 x 3.35

The parent bird is under ordinary circumstances easily dislodged from the nest, but occasionally is quite obstinate in this particular. The Red-headed Woodpecker sometimes attacks other birds which approach too closely its nesting place. On one occasion three of these Woodpeckers were observed to utterly rout a Red-tailed Hawk.

SUBGENUS **CENTURUS** SWAINSON.



RED-BELLIED WOODPECKER, REDUCED.

81. *Melanerpes carolinus* (LINN.).

Red-bellied Woodpecker.

A tolerably common resident, but most regularly observed during fall and winter; frequenting then more open woodland than during the breeding season. It is

usually very wild and wary, especially when in the upland woods, remaining chiefly in the tops of the trees. It is not often found in company with other species.

The only nest that has fallen under the writer's observation was discovered April 2, 1893, in the midst of a large forest. The excavation was near the top of a sugar maple (*Acer Saccharum*), in a dead portion of the trunk, and bore evidence of recent operation, as the ground at the foot of the tree was plentifully strewn with chips. The male was at first seen passing in and out of the opening, but upon his discovery of the presence of spectators, he retreated into the nest, and no amount of noise or pounding on the tree could induce him to again venture farther than the entrance.

GENUS **COLAPTES** SWAINSON.

82. **Colaptes auratus** (LINN.).

Flicker.

A permanent resident, but less abundant in winter than at other seasons. Most of those that remain through the cold weather retire to the swamps and woods along the streams, where natural cavities and old Woodpecker's excavations furnish suitable abodes. At other times the species is to be found almost anywhere, though apparently only casually in the towns.

Nesting sites are chosen with apparent indifference, though not usually above thirty feet from the ground. Mating takes place about the middle of April, and the six or seven eggs are deposited usually between the tenth of May and the first of June. The female occasionally, but not commonly, incubates so closely that it is necessary to use force to remove her from the nest.

The measurements obtained from four nests are as follows:

No.	Total depth.	Diameter of entrance.	Diameter at entrance.	Diameter at middle.	Diameter at bottom.
1.....	14.00	3.00 x 2.50	.....	.....	.....
2.....	13.00	2.75 x 2.88	.....	.....	.....
3.....	18.00	2.00 x 2.00	.....	.....	.....
4.....	7.00	4.00 x 4.00	6.00 x 5.00	5.00	5.00 x 4.00
Average...	13.00	2.94 x 2.72	.....	.....	.....

ORDER MACROCHIRES. GOATSUCKERS, SWIFTS, ETC.

SUBORDER CAPRIMULGI. GOATSUCKERS, ETC.

FAMILY CAPRIMULGIDÆ. GOATSUCKERS, ETC.

GENUS **ANTROSTOMUS** GOULD.

83. **Antrostomus vociferus** (WILS.).

Whip-poor-will.

A tolerably common summer resident from May until September. It frequents almost exclusively the dry upland woods, being seldom found on the lowlands.

On May 29, 1892, an individual of this species was heard singing under bright sunlight at 3:30 P. M. Other than on this occasion it has not been heard during daylight later than 4 A. M.

GENUS **CHORDEILES** SWAINSON.

84. *Chordeiles virginianus* (GMEL.).

Nighthawk ; Bull-bat.

A common summer resident from May 7 to September 14. It is more numerous during migrations, especially in the fall, though there have been here observed no large flights such as elsewhere frequently occur. It may occasionally be seen at dusk on spring evenings, in the streets and yards of the town, whither it appears to have ventured in pursuit of food. It is often abroad in bright sunlight, usually in the afternoon, but is seldom seen in company with other birds.

A single egg of this species was found on June 20, 1893, in a strawberry patch on the outskirts of Wooster. This nest having been disturbed, a clutch of two eggs was later discovered in the same situation. Although these are the only actual records obtained, the Nighthawk undoubtedly breeds regularly in this locality.

SUBORDER CYPSELI. SWIFTS.

FAMILY MICROPODIDÆ. SWIFTS.

SUBFAMILY CHÆTURINÆ. SPINE-TAILED SWIFTS.

GENUS **CHÆTURA** STEPHENS.

85. *Chætura pelagica* (LINN.).

Chimney Swift.

An abundant summer resident ; especially numerous in the towns. The earliest date of its spring arrival is March 28 (1890), the latest April 21 (1892), but it usually appears about the middle of April. The dates of its disappearance in fall range between October 1 and October 7.

From the last part of April until the twentieth of May, each year, the Swifts congregate in Wooster almost daily, to roost in a chimney of the court-house. One hundred and fifty to two hundred are usually seen at first, the number being gradually augmented until about May 10, after which time it generally soon begins to decrease. Sometimes as many as 1,000 birds have been seen in the vicinity of the court-house, but this number has probably never been exceeded. While their usual time of congregating is between six and seven o'clock in the afternoon, they have not infrequently been observed entering the chimney during the middle of the afternoon. Less commonly are they to be seen in numbers about the chimney during the forepart of the day, but on a few occasions they have been observed entering even as early as half-past seven or eight A. M. The darkening of the sky by an approaching thunder-shower, especially if in the afternoon, generally causes them to assemble and enter their roosting place ; and frequently they do not emerge after the storm has passed.

They always resort to a particular large six-flued chimney, one of the flues of which is very often in use. They do not, however, seem to be in the least annoyed by the smoke which issues from this part of the chimney, but drop unconcernedly into

the unused portions. For a short time in the spring they sometimes have recourse to the large chimney of a church, but as their numbers increase this is promptly abandoned for the presumably more commodious one of the court-house close at hand. Occasionally during the summer (from June to September), the Swifts to the number of one or two hundred may be seen to enter the court-house chimney, but this does not appear to be a common or regular occurrence.

The breeding season is in June; and four or five eggs constitute the usual complement. The female when frightened from the nest, instead of leaving entirely, very frequently retreats down the chimney, being with considerable difficulty induced to reappear.

SUBORDER TROCHILI. HUMMINGBIRDS.

FAMILY TROCHILIDÆ. HUMMINGBIRDS.

GENUS **TROCHILUS** LINNÆUS.

SUBGENUS **TROCHILUS**.

36. **Trochilus colubris** LINN.

Ruby-throated Hummingbird.

An abundant summer resident. It appears in spring with considerable regularity between the first and the tenth of May, and remains until September, not, however, being common after the first of this month. It is very partial to the flowers of the buckeye (*Æsculus glabra*), and while this tree is in bloom, during the early part of May, assembles often in numbers wherever these favorite flowers are to be found.

In this locality the Hummingbird nests chiefly in June and the early part of July, though eggs have been taken by Mr. Henderson as late as July 24. An apple orchard is apparently the preferred situation. If the first nest be disturbed a second is often if not always constructed.

As of possible interest in connection with the statements of Mr. Bradford Torrey¹ in regard to the absence of the male from the nest during the period of incubation and of rearing the young, it may be stated that on two occasions the writer has observed the male at the nest: On June 26, 1892, when a male was seen with the female about a nest which contained eggs; and on July 4, 1892, when the male alone was noted at another nest which was occupied by two young birds apparently but two or three days old.

Early in the morning on June 1, 1892, a Hummingbird was noticed fluttering up and down against the plate glass of a large show window on one of the main business streets of Wooster, and apparently attempting to enter the window as if unaware of the impenetrable nature of the glass.

¹ The Footpath Way, 1893, pp. 135 et seq.

ORDER PASSERES. PERCHING BIRDS.

SUBORDER CLAMATORES. SONGLESS PERCHING BIRDS.

FAMILY TYRANNIDÆ. TYRANT FLYCATCHERS.

GENUS **TYRANNUS** CUVIER.87. **Tyrannus tyrannus** (LINN.).**Kingbird.**

An abundant summer resident. Its earliest recorded spring arrival is April 19 (1891), but its average date is about two weeks later. Few are to be seen after the first of September, though individuals have been observed to linger until October 3.

In this locality this species is apparently late in nesting, for with one exception a complement of eggs has not been noted before June 20, but fresh eggs have been taken in July. A set of three secured on July 7, 1891, contained eggs varying from fresh to three-eighths incubated. A large proportion of the nests found have been in apple orchards.

The measurements of two nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	8.25	1.75	3.00 x 2.75	2.75 x 2.50	4.50 x 4.00	5.50 x 4.25	4.00 x 4.00	0.88 x 0.50
2.....	8.00	2.00	3.00 x 2.75	2.90 x 2.60	5.75 x 4.50	5.75 x 4.50	4.50 x 3.75	1.25 x 0.60

The Kingbird is one of the earliest birds to be astir in the morning, the notebook of the writer showing that this species was, on March 27, 1890, first heard at 3:30 A. M.

That the Kingbird possesses remarkably acute vision may be inferred from the following circumstance. On June 5, 1892, while the writer was strolling along the railroad track, which is here situated near the stream of the Killbuck, a Kingbird was seen to start from a telegraph pole and fly swiftly in a direct line to capture an insect so small as to be invisible to the human eyes only twenty-five feet away, yet by actual measurement the distance from which this bird had espied its victim was one hundred and fifty feet.

This species was observed feeding upon berries of the dogwood (*Cornus florida*), on July 31, 1892.

GENUS **MYIARCHUS** CABANIS.88. **Myiarchus crinitus** (LINN.).**Crested Flycatcher.**

A tolerably common summer resident; much more numerous in the spring. It arrives usually between the first and the tenth of May, but the earliest date is April 24 (1892). Though not common after the first of September, it has been observed as late as October 2. While it is found during the spring chiefly in the woodlands, it appears to resort principally to orchards for the purpose of breeding.

GENUS **SAYORNIS** BONAPARTE.**89. Sayornis phœbe (LATH.).****Phœbe.**

An abundant summer resident. The earliest date of its spring arrival is March 17 (1894); the latest, March 30, (1890). It remains until some time in October, the date on which it has been latest observed being October 19 (1892).

Nidification is begun in April, and incompleated nests have been noted as early as April 9 (1893). A second brood is commonly reared in June. The supporting timbers of bridges are the favorite nesting sites, and most of the nests found have been thus situated. A ledge of rocks or an old stone quarry is, however, by no means an uncommon location.

Four nests present the following measurements:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outsidetop diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	3.50	2.00	2.75 x 2.88	1.25 x 1.18	5.00 x 4.00	5.50 x 4.25	5.00 x 4.00	2.25 x 0.25
2.....	6.00	1.56	3.50 x 2.75	2.38 x 2.25	4.50 x 3.75	5.00 x 3.00	2.00 x 2.00	1.50 x 0.50
3.....	3.00	2.00	2.75 x 2.88	2.38 x 2.25	4.25 x 3.50	5.25 x 4.25	4.25 x 3.00	1.00 x 0.25
4.....	4.50	1.75	2.50 x 2.00	2.38 x 1.88	5.00 x 4.50	5.75 x 5.25	7.00 x 4.75	1.75 x 0.25
Average	4.25	1.83	2.88 x 2.88	2.10 x 1.88	4.69 x 3.94	5.38 x 4.19	4.56 x 3.44	1.63 x 0.31

GENUS **CONTOPUS** CABANIS.SUBGENUS **CONTOPUS.****90. Contopus virens (LINN.).****Wood Pewee.**

A summer resident; abundant. Its dates of spring arrival range from May 7 to May 14, and it remains until September, not having been noted, however, later than the twenty-first of this month. Although early in spring frequenting especially the woodlands, it is to be found breeding chiefly in the numerous apple orchards. In fact, it is, under ordinary circumstances, rather the exception to find an apple orchard of any considerable size which does not possess its pair of these birds. So far as the writer's observations extend, only one pair occupy any single orchard.

The nest is rarely more than fifteen feet from the ground, and is often much less. The number of eggs is usually three, but occasionally only two. The height of the breeding season seems to be about the twenty-fifth of June,—eggs having been taken from June 14 to July 5.

The dimensions of five nests are as follows :

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	1.75	1.25	2.00 x 1.75	1.85 x 1.75	3.00 x 2.50	3.25 x 3.00	3.00 x 2.50	0.65 x 0.35
2.....	1.50	1.50	2.00 x 1.85	2.15 x 2.00	3.15 x 2.60	3.85 x 3.00	3.15 x 2.75	0.80 x 0.35
3.....	1.05	0.85	1.85 x 1.65	1.80 x 1.60	3.50 x 2.25	3.50 x 2.35	3.50 x 2.10	1.00 x 0.35
4.....	1.40	0.90	2.00 x 1.75	2.25 x 1.80	2.85 x 2.50	3.25 x 3.00	3.25 x 3.00	0.60 x 0.30
5.....	1.60	1.10	2.00 x 1.75	1.90 x 1.70	3.10 x 2.40	3.25 x 2.60	3.25 x 2.50	0.75 x 0.30
Average..	1.46	1.12	1.97 x 1.75	1.99 x 1.77	3.12 x 2.45	3.32 x 2.79	3.23 x 2.57	0.76 x 0.31

GENUS **EMPIDONAX** CABANIS.

91. **Empidonax flaviventris** BAIRD.

Yellow-bellied Flycatcher.

A rare spring and fall transient visitor. It has been observed only in May and September, in thickets and the undergrowth of woodland.

The stomach of a specimen taken September 18, 1892, contained the remains of two or three striped squash-beetles (*Diabrotica vittata*) and a dung-beetle (*Atanius stercorator*).

92. **Empidonax virescens** (VIEILL.).

Green-crested Flycatcher.

A summer resident; common for a while in the spring, but during the breeding season less numerous, and inhabiting then only certain localities. The earliest date of its spring arrival is April 30 (1891), but it has in other years not been noted before the middle of May. It departs usually not later than the first of September.

93. **Empidonax traillii** (AUD.).

Traill's Flycatcher.

A tolerably common summer resident, but of very local distribution. It appears in spring during the first half of May, the earliest record being May 1, and remains until September.

It has been found nesting in only one locality, a mill-race in the valley of the Applecreek, a short distance southeast of Wooster. This mill-race is thickly fringed with a growth of elders (*Sambucus Canadensis*), and though situated between the railroad track and cultivated fields, seems to have a special attraction for Traill's Flycatcher, as several pairs breed here annually. Eggs have been obtained between the dates of June 10 and July 14 inclusive; those on the latter date, however, belonging probably to a pair from which eggs had previously been taken. None of the nests found were higher from the ground than six feet, most of them less than four and one-half feet; all being built in elder bushes, and by no means difficult to discover. Four eggs seem to constitute the ordinary complement, only one set (July 14, 1892) consisting of a smaller number. A nest taken June 15, 1892, contained four eggs of its owner with one of the Cowbird; the Cowbird's egg having been deposited before any of the others.

Six nests measured furnish the following results :

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	2.50	1.65	2.05 x 1.85	2.15 x 2.05	3.00 x 2.60	2.75 x 2.50	2.75 x 1.75	0.50 x 0.20
2.....	2.35	1.30	2.00 x 1.75	2.00 x 1.90	3.10 x 2.85	3.25 x 3.00	2.75 x 2.25	0.50 x 0.45
3.....	2.75	1.65	2.10 x 1.75	2.30 x 1.70	2.85 x 3.50	3.25 x 2.50	2.10 x 1.85	0.75 x 0.25
4.....	2.60	1.50	2.25 x 1.75	2.25 x 2.00	3.35 x 2.60	3.00 x 2.75	2.50 x 1.75	0.50 x 0.20
5.....	2.75	1.85	2.10 x 1.85	2.10 x 1.85	3.00 x 2.65	2.75 x 2.00	2.50 x 1.25	0.60 x 0.35
6.....	3.25	1.40	2.50 x 1.75	2.40 x 2.00	3.25 x 2.35	4.00 x 3.25	2.00 x 1.50	0.60 x 0.20
Average..	2.70	1.48	2.17 x 1.78	2.20 x 1.92	3.01 x 2.59	3.17 x 2.67	2.48 x 1.72	0.63 x 0.28

94. *Empidonax minimus* BAIRD.

Least Flycatcher.

A tolerably common spring transient from May 1 to 24, but has not been observed in the fall. During its passage through the County it is found almost exclusively in woodland.

Contrary to the statement of Dr. Wheaton,¹ the characteristic note of this species is here frequently heard during the migration.

SUBORDER OSCINES. SONG BIRDS.

FAMILY ALAUDIDÆ. LARKS.

GENUS *OTOCORIS* BONAPARTE.



HORNED LARK, MUCH REDUCED.

95. *Otocoris alpestris* (LINN.).

Horned Lark.

Winter visitor; rare. A single specimen in the writer's collection is the only record. This was taken December 28, 1892, from a flock of about twenty-five individuals, three others of which, also secured, proved to be fairly typical *pratricula*.

¹Geological Survey of Ohio IV, 1882, p. 379.

From the rarity of *Otocoris alpestris* in Indiana and in western Pennsylvania, its uncommon occurrence in Ohio, except perhaps in the extreme northern portion, may be reasonably inferred. This supposition is borne out by the facts at present available, for the specimen mentioned above is apparently the fourth published record of its unequivocal appearance in the State; all other mention of this form referring without much doubt to *Otocoris alpestris praticola*. The previous records are by Dr. J. Dwight Jr.,¹ who mentions specimens from Cleveland and Circleville, Ohio; and by Mr. Lynds Jones,² who found the species at Oberlin during the winter of 1895-6.

96. *Otocoris alpestris praticola* HENSH.

Prairie Horned Lark.

A permanent resident; common during the winter months, but less numerous in summer. It occurs throughout the former season principally in flocks, frequenting chiefly the upland fields or public roads, sometimes associated with the Snowflake (*Plectrophenax nivalis*). A flock of 140 Horned Larks was seen on the lowland meadows along Killbuck Creek, April 23, 1893.

A nest of this subspecies, built as usual upon the ground, and containing two eggs together with two callow young, was observed by W. E. Henderson, near Wooster, in June 1893. A young bird in first plumage was shot by the writer from a flock of five, on June 26, 1891.

This form of the Horned Lark has for some years been considered a summer resident throughout the northern portion of Ohio, but definite data from this state are few, although it has been with comparative frequency reported breeding in contiguous portions of Pennsylvania.³ Aside from the map of its breeding range published by Dr. J. Dwight Jr.,⁴ the only previous records of its breeding in Ohio appear to be as follows:

DAVIE, Nests and Eggs of North American Birds, 1889, page 254;—young taken in May in northwestern Ohio.

WHEATON, Geological Survey of Ohio IV, 1882, page 589;—said by Mr. Chubb to breed near Cleveland.

VICKERS, Oölogist XII, 1895, page 108;—a nest containing three young found April 17, 1895, near Ellsworth, Mahoning County, Ohio.

A male in breeding plumage taken June 26, 1891, and a female in fall dress collected October 30, 1890, are paler than typical specimens and very closely resemble corresponding plumages of *Otocoris alpestris arenicola* from Montana.

¹ Auk VII, 1890, p. 142.

² Bulletin of Wilson Ornithological Chapter, No. 7, March 30, 1896.

³ WARREN, Report on Birds of Pennsylvania, 1890, p. 198.

⁴ Auk. VII, 1890, map facing p. 158.

FAMILY **CORVIDÆ**. CROWS, JAYS, MAGPIES, ETC.SUBFAMILY **GARRULINÆ**. MAGPIES AND JAYS.GENUS **CYANOCITTA** STRICKLAND.**97. Cyanocitta cristata (LINN.).****Blue Jay.**

An abundant resident, but especially numerous during fall and early spring.

Nesting is begun sometimes by April 10, but the height of the breeding season is in May. In the matter of nesting sites a preference seems to be shown for the thorn bushes (*Crataegus*), though various other situations are also chosen. The nest is usually placed not over fifteen feet from the ground, though in one instance the distance was forty-two feet. The eggs are four or five in number, and are sometimes in varying stages of incubation.

A set of five eggs, taken in this locality on May 1, 1890, seems sufficiently different from the usual type of coloration to merit a description. The ground color is a rich cream buff, with small markings of vandyke brown, tawny olive, broccoli brown, clay color, wood brown, drab, dull lavender and ecru drab; these markings occurring most numerously at the larger ends of the eggs. These eggs measure respectively: 1.16 x .78, 1.08 x .79, 1.11 x .79, 1.16 x .79, 1.11 x .77.

All the nests (nine in number) which have been examined by the writer have revealed the employment of more or less mud in their construction. Many of them were cupped and plastered with this material to as great an extent as is characteristic of the nest of the Robin. If this use of mud by the Blue Jay is of general occurrence, it would seem somewhat strange that more mention has not been made of the fact in the literature of the subject. The only notice of such a habit, so far as the present writer has been able to ascertain, is to be found in Baird, Brewer and Ridgway's History of North American Land Birds, Volume II, page 275; and in Thos. G. Gentry's Life Histories of the Birds of Eastern Pennsylvania, Volume II, page 21. The same sentence occurs in both these works and is as follows:—

"In Texas according to Dr. Lincecum the nest is built of mud, which is rarely if ever utilized in more northern localities."

The measurements of eight nests are herewith given:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	6.50	1.88	4.00 x 3.25	3.25 x 3.12	7.50 x 5.75	8.00 x 6.50	8.00 x 1.25	8.00 x 0.63
2.....	3.00	1.75	4.25 x 3.50	3.75 x 3.00	6.50 x 4.50	7.00 x 5.00	7.00 x 3.50	2.00 x 0.50
3.....	5.00	1.75	3.75 x 3.75	3.75 x 3.38	6.50 x 5.00	6.50 x 6.00	6.00 x 4.00	2.00 x 0.75
4.....	4.50	2.10	3.50 x 3.00	3.90 x 3.15	6.25 x 4.75	8.00 x 5.25	5.50 x 4.00	2.00 x 0.50
5.....	5.00	2.50	4.00 x 3.50	3.38 x 3.38	5.50 x 4.75	10.50 x 7.00	7.00 x 6.00	1.75 x 0.13
6.....	4.00	2.00	4.25 x 4.00	3.25 x 3.25	6.50 x 5.50	7.50 x 7.00	5.50 x 5.00	1.25 x 0.50
7.....	4.50	2.25	4.00 x 3.50	3.50 x 3.25	7.00 x 6.00	9.00 x 5.00	5.00 x 3.50	1.75 x 0.63
8.....	3.50	2.00	4.00 x 3.63	3.63 x 3.50	5.75 x 5.50	6.00 x 5.50	6.00 x 5.00	1.38 x 0.63
Average	4.50	2.03	3.97 x 3.52	3.55 x 3.25	6.44 x 5.22	7.81 x 5.91	6.25 x 4.08	1.89 x 0.58

Three Blue Jays were on July 27, 1890, observed chasing a Red-tailed Hawk in regular Kingbird fashion, much to the evident discomfort of the Hawk, and apparently to the equally great delight of the Jays. Notwithstanding its well attested propensity for annoying other birds, the Blue Jay is itself occasionally the injured party, even at the hands of its inferiors, for it has been seen put to flight by the combined efforts of a Baltimore Oriole and a Warbling Vireo.

On September 26 and 27, 1890, several Blue Jays were observed feeding extensively on the acorns of the laurel oak (*Quercus imbricaria*). The examination of stomachs from individuals taken during the fall and winter months indicates that the food of this species at these seasons consists largely of mast.

SUBFAMILY CORVINÆ. CROWS.

GENUS CORVUS LINNÆUS.

98. *Corvus americanus* AUD.

American Crow.

An abundant summer resident, perhaps remaining also during mild winters. Although it has been ascertained to sometimes pass even a severe winter in Summit County, Ohio,¹ the writer has no positive knowledge of its presence throughout the whole of this season within the region at present under consideration. One individual was heard January 1, 1892; and Mr. C. E. Bixler found one frozen to death in a brush-heap, four miles north of Wooster, on January 4, 1887; these being the only records for either December or January. The Crow appears in February, sometimes as early as the second of the month, and disappears late in October or early in November; the latest date on which it has been observed being November 6, (1892).

The breeding season begins often very early in April, probably sometimes in March. Nests with eggs are not common after the middle of May. As to location, a preference seems to be shown for the woods of the bottom-lands, where the nest is frequently placed in a swamp maple (*Acer rubrum*), ordinarily among the upper branches. The eggs are generally five, sometimes in varying stages of incubation.

The measurements of four nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	12.00	5.50	7.75 x 7.00	7.00 x 6.50	16.00 x 12.00	16.00 x 12.00	12.00 x 6.00	5.00 x 0.75
2.....	12.00	5.00	8.00 x 7.25	6.50 x 6.00	18.00 x 13.00	22.00 x 14.00	9.00 x 9.00	7.50 x 2.50
3.....	16.00	4.00	8.50 x 6.75	6.50 x 6.00	16.00 x 16.00	16.00 x 16.00	8.00 x 6.00	6.00 x 3.00
4.....	11.00	3.50	7.25 x 6.25	5.50 x 5.50	13.00 x 6.50	16.00 x 11.00	16.00 x 8.00	8.00 x 1.00
Average..	12.75	4.50	7.88 x 6.94	6.38 x 6.00	15.75 x 11.88	17.50 x 10.75	11.25 x 7.25	5.38 x 1.81

The female may usually without difficulty be induced to leave the nest, but occasionally even the most vigorous rapping proves unavailing, in which case a stick thrown and striking near the nest almost invariably has the desired effect.

The Crow in this locality seems to have a particular animosity towards both the Red-tailed and Red-shouldered Hawks, and may often be seen annoying them; yet notwithstanding this, it is exceptional, as has been previously stated, to find a domicile of the Red-shouldered Hawk without the presence of a Crow's nest in the vicinity.

¹ Annual Report of Ohio Academy of Sciences II, 1894, p. 12.

A somewhat interesting case of rostral malformation is exhibited by a mounted Crow in the possession of Mr. R. A. Schnably, of West Salem. The mandible is perfectly normal; but the maxilla, though of usual length, is curved downward, crossing the mandible on the left side, and describing a complete semi-circle, so that its tip is below and on nearly a vertical line with the base of the bill. It would seem that such abnormality could hardly fail to seriously interfere with the bird's feeding, yet this Crow was, as Mr. Schnably informed me, very fat and apparently in perfectly healthy condition.

FAMILY ICTERIDÆ. BLACKBIRDS, ORIOLES, ETC.

SUBFAMILY ICTERINÆ. BLACKBIRDS, ORIOLES, ETC.¹

GENUS **DOLICHONYX** SWAINSON.

99. **Dolichonyx oryzivorus** (LINN.).

Bobolink.

An abundant summer resident. It appears in spring generally during the first week of May, but in 1891 was noted April 21. It retires southward ordinarily by the first of October.

About the first of July it begins to gather into flocks, which apparently seldom exceed two hundred and fifty individuals. The males continue in spring plumage until at least the middle of July. During the month of September, and sometimes in August, especially on dark cloudy nights, this species may be heard passing over the city on its southward migration.

The Bobolink breeds chiefly during the last of May and in June, the nest being usually located in a grass field, on either the uplands or the lowlands. Late nests are not infrequently destroyed by the mowing of the grass in the fields where they happen to be situated. This species seems to be, if anything, slightly on the increase in this region.

GENUS **MOLOTHRUS** SWAINSON.

100. **Molothrus ater** (BODD.).

Cowbird.

An abundant summer resident. It arrives usually between the middle of March and the first of April, the earliest date noted being March 16 (1894). It disappears in October, not having been seen after the twentieth of this month.

In spring it moves chiefly in small companies, flocks of over a hundred being the exception; but after the breeding season, in July or early in August, it begins to collect again into flocks, which thereafter often aggregate several hundred individuals. It is frequently found associated in spring and autumn with numbers of both Red-winged Blackbirds and Bronzed Grackles. It is also occasionally noted in company with Robins.

¹ The two subfamilies of *Icteridæ* are not recognized in the A. O. U. Check List, but are apparently advisable divisions.

The Cowbird seems here to most frequently invade the nest of the Rose-breasted Grosbeak, and not uncommonly deposits two or three eggs in a single nest. Next to the Rose-breasted Grosbeak, the Yellow Warbler and Wood Thrush are probably the species most frequently imposed upon by this parasite.

On June 22, 1890, a nest of the Yellow Warbler was found to contain one young Warbler and two eggs about to hatch, together with one Cowbird's egg which was nearly fresh. A Song Sparrow's nest containing two young Sparrows, and a Cowbird's egg only one-eighth incubated, was observed June 5, 1892. From these instances it would seem evident that the Cowbird sometimes makes mistakes in the deposition of its eggs, placing them in nests where exists at most but small probability of their being hatched. On June 22, 1891, there was discovered a Yellow Warbler's nest containing one young Warbler and a young Cowbird, both about two-thirds fledged. The two quite filled the nest, the Cowbird by its much greater size being readily distinguished. Whether or not in this case the young Cowbird eventually appropriated the entire nest, as is said to be a common occurrence, was unfortunately not possible to determine.

GENUS **AGELAIUS** VIEILLOT.

101. **Agelaius phoeniceus** (LINN.).

Red-winged Blackbird.

An abundant summer resident. It appears in spring generally during the first week of March, but was in 1892 noted on February 25. It departs rarely before November 1, sometimes remaining until November 30.

From the time of its arrival it moves much in flocks, and is to be seen almost everywhere, resorting, however, at night in great numbers to the swamps to roost. This continues until the latter part of April, when the birds become more or less scattered for the purpose of breeding, which takes place chiefly in May and the first part of June.

During the nesting season the Red-winged Blackbird may be found in almost every swamp and marsh, though apparently more than a few pairs seldom breed together. The nest is very frequently placed in a bush or small tree, especially a willow, and is sometimes ten or fifteen feet from the ground. The eggs appear to be usually four in number.

Six nests afford the following measurements:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	4.25	2.50	3.12 x 2.25	3.12 x 2.50	6.00 x 4.00	5.75 x 5.00	2.50 x 2.25	2.50 x 0.25
2.....	5.50	3.00	2.50 x 2.50	3.00 x 2.50	6.00 x 5.00	4.00 x 3.75	2.50 x 1.50	.....
3.....	5.00	3.50	2.63 x 2.63	3.00 x 2.75	4.88 x 4.88	5.00 x 5.00	3.00 x 2.50	1.38 x 0.88
4.....	4.00	2.50	2.80 x 2.63	2.88 x 2.75	5.00 x 4.00	4.75 x 4.75	2.50 x 2.00	1.25 x 0.25
5.....	3.85	2.25	3.00 x 2.70	3.15 x 3.00	4.85 x 4.00	4.75 x 4.25	4.00 x 3.00	1.10 x 0.50
6.....	3.50	2.25	3.00 x 2.75	3.40 x 3.00	4.00 x 4.00	4.75 x 4.00	3.50 x 2.75	0.85 x 0.45
Average.	4.27	2.67	2.84 x 2.58	3.09 x 2.75	4.96 x 4.28	4.83 x 4.46	3.00 x 2.33	1.42 x 0.37

This species exhibits considerable courage in defense of its nest, attacking without hesitation such birds as the Red-shouldered and Sparrow Hawks, the Crow and the Kingfisher, usually with success,—often putting them to flight single-handed. An attack upon the Cliff Swallow, on account of a supposed intrusion, does not seem to be so well justified.

By the middle of June, or even earlier, the Red-winged Blackbird commonly begins to reassemble into small flocks, which gradually increase in size as the summer advances, reaching their maximum during August. These hordes, often in company with numerous Bronzed Grackles, again resort to the swamps and marshes to roost, there occupying for this purpose the cat-tails (*Typha latifolia*), as well as the bushes and trees.

GENUS **STURNELLA** VIEILLLOT.

102. **Sturnella magna** (LINN.).

Meadowlark.

Resident; abundant during the spring, summer and fall, but not very common in winter. It remains throughout the last mentioned season principally on the bottom-lands and in the more sheltered fields of the uplands. It occurs to some extent in small flocks from about the first of July until April. A flock seen January 4, 1892, was accompanied by about fifty Horned Larks. The Meadowlark is comparatively seldom noted in the towns, but during March and April it is occasionally observed flying over. It nests generally in May, in suitable situations on both the uplands and the bottoms.

This species commonly begins to sing about the latter part of February, but has been heard, though rarely, as early as the first of January. It continues in song almost uninterruptedly from February until November. Mr. E. P. Bicknell mentions¹ the absence of song during September and the latter part of August, but the writer's experience has been to find the species in fairly good song often through both August and September.

GENUS **ICTERUS** BRISSON.

SUBGENUS **PENDULINUS** VIEILLLOT.

103. **Icterus spurius** (LINN.).

Orchard Oriole.

A tolerably common summer resident. It is apparently more numerous some years than others, though never more than locally common. According to the notes of the writer, it arrives between May 3 and May 16.

It frequents almost exclusively orchards and the vicinity of country dwellings, in which localities it breeds. It apparently does not often venture into the towns beyond their outskirts, but one was seen singing, on July 3, 1893, near the center of the business portion of Wooster.

The exhibition of a trait that we are loth to believe characteristic of the species was observed by the writer on May 20 1890. A Warbling Vireo was busily engaged

¹ Auk II, 1885, p. 251.

in constructing its nest on one of the outer branches of a large wild cherry tree (*Prunus serotina*), which stood in a thicket along a mill-race, adjacent to apple orchards and a farm-house. A female Orchard Oriole quietly occupied a neighboring tree until the Vireo, after bringing material to its nest and satisfactorily arranging the same, should depart; when she too visited the nest and bore away in her bill such of the material as she could easily detach,—without doubt for the construction of her own nest. This theft was a number of times repeated, always in the same manner; but the Vireo finally discovered that something was wrong, and with the assistance of its mate, ended by driving the Oriole off the scene.

The Orchard Oriole has been heard singing as late as August 28 (1890), which date is also the latest fall record for the occurrence of the species.

SUBGENUS *YPHANTES* VIEILLOT.

104. *Icterus galbula* (LINN.).

Baltimore Oriole.

An abundant summer resident. Its arrival during the four years of the writer's observations has been between April 28 and May 5, inclusive. It has not been noted later than September 18 (1892), when one was heard singing in Wooster.

The nesting season is in May and the early part of June. Ordinarily full complements of fresh eggs are to be obtained within a few days of the first of June, though some nests may contain young at this time. An exception was noted in 1891, when all the nests examined between May 28 and June 4 contained either callow young or heavily incubated eggs. Four or five eggs is the usual number, though a nest occupied by only three young is occasionally noticed. With regard to the location of the nest, a preference seems to be evinced for trees in the immediate vicinity of running water, but in the absence of such, orchards or ornamental trees are with equal readiness utilized. The nest is very often placed in an elm (*Ulmus Americana*), where it is not infrequently in a practically inaccessible position at the extremity of a long drooping branch, fifty or seventy-five feet from the ground. Of other native trees, the buckeye (*Esculus glabra*), the sycamore (*Platanus occidentalis*) and maple (*Acer rubrum*) seem to be most frequently chosen.

The measurements of six nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	7.00	6.00	2.00 x 1.75	4.00 x 3.25	3.75 x 3.00	4.00 x 3.50	3.25 x 3.00	0.33 x 0.25
2.....	6.00	5.00	2.63 x 2.00	3.50 x 3.00	3.25 x 2.50	4.00 x 4.00	2.75 x 2.00	0.50 x 0.06
3.....	6.00	5.25	2.25 x 1.75	3.50 x 2.90	3.50 x 2.50	4.00 x 3.50	2.50 x 2.50	1.25 x 0.25
4.....	5.75	5.25	2.00 x 1.50	3.50 x 3.25	3.50 x 2.50	4.00 x 3.50	3.00 x 2.50	1.00 x 0.20
5.....	4.75	4.00	2.25 x 1.50	3.50 x 3.00	3.25 x 2.50	4.75 x 3.50	4.50 x 3.25	1.00 x 0.25
6.....	4.00	3.75	3.00 x 2.00	4.35 x 3.50	3.25 x 2.25	4.75 x 4.25	4.50 x 3.25	0.50 x 0.10
Average..	5.58	4.88	2.36 x 1.75	3.73 x 3.15	3.42 x 2.64	4.25 x 3.71	3.42 x 2.75	0.77 x 0.19

SUBFAMILY QUISCALINÆ. GRACKLES.

GENUS **SCOLECOPHAGUS** SWAINSON.**105. *Scolecophagus carolinus* (MÜLL.).****Rusty Blackbird.**

A common spring and fall transient, usually quite numerous for a short time during both these seasons. It has been in spring noted from March 25 to May 8, though usually arriving about the middle of April and disappearing by the first of May. In fall this species has been observed from October 2 (1893) to November 24 (1890).

Throughout both its migration periods it moves principally in flocks of less than 100, often in parties of from two to five individuals; a flock of 400 was, however, seen April 23, 1893. It associates frequently with Red-winged Blackbirds; also, though less commonly, with Bronzed Grackles. It affects preferably the marshes and swampy woods on the bottom-lands, but has been observed in the upland forests as well.

GENUS **QUISCALUS** VIEILLLOT.SUBGENUS **QUISCALUS.****106. *Quiscalus quiscula æneus* (RIDGW.).****Bronzed Grackle.**

An abundant summer resident. It arrives usually about the first of March, though sometimes as early as February 25 (1890). It generally disappears before the first of November, but during the winter of 1892-3, which moreover, was not especially mild, a few birds, probably the same individuals, were seen at intervals until January 21, in fields and about dwellings on the outskirts of Wooster.

Until at least the middle of April this species may be seen often in flocks, which consist, however, of usually not more than one hundred birds; while even during the nesting season it sometimes assembles into small companies, especially in the vicinity of a breeding colony. Subsequent to the middle of June, and continuing until its departure in the fall, it again collects into flocks, which then often aggregate several hundred individuals.

The Bronzed Grackle congregates in numbers at its roosting places every night in both spring and fall, but especially during the latter season. These roosts are situated in the trees along the streets of the towns, about rural dwellings, in woodlands or in swamps. Such a roost existed in the town of Wooster, and was occupied chiefly from June to August. Frequently here the birds could be heard at night, occasionally creating among themselves, even at a late hour, a disturbance sufficient to be audible at a considerable distance.

The Bronzed Grackle breeds most abundantly in the vicinity of dwellings, and for nesting purposes seems to much prefer the evergreen trees; yet nests have also been observed in thorn bushes (*Crataegus*) on the bottom-lands. If the tree selected be a spruce, the nest is usually placed close to the trunk, at a distance from the ground varying with the size of the tree, the best concealment possible being apparently sought; but if the nest be in a pine, it is generally located either at some distance from the trunk among the thick foliage of a horizontal branch, or in an upright fork near the very top of the tree.

The construction of the nest is initiated sometimes early in April, but full complements of eggs have not been found until about the first of May. Sets of eggs have been taken from May 6 to May 24; those on the latter date being, however, from abandoned nests. The eggs appear to be usually five, not uncommonly four in number; and they are quite often in varying stages of incubation.

The nests are by no means always easy to locate among the thick foliage of the evergreens, the conduct of the parent birds being at times decidedly misleading. Where a number of pairs breed near together, careful watching is frequently necessary to properly discriminate between those birds which visit the trees for the purpose of nest-building, and those that are indifferently moving about. Close observation, managed so that the attention of the birds be not attracted, will reveal the fact that the female, on her trips to the nest with material for its construction, is commonly accompanied by the male, who perches upon the same or a neighboring tree, while his mate, alighting near the end of a limb and slowly working her way inward, finally disappears among the foliage close to the nest. Should, however, the pair imagine themselves observed, their actions are apt to be very different; for under such circumstances they will sometimes pass by the tree that contains the nest, and alight unconcernedly some distance away. If the cause of their distrust be not removed, no visit to the nest will then be made; and the female may carry her deception even to the extent of dropping from her bill the grass or straw that she holds, thereupon soon flying with her mate carelessly away. The female is very cautious in leaving the nest, and is not readily surprised in the act of incubating. A nest containing eggs not far advanced in incubation, if even once examined, is liable to be deserted by the birds.

Ten nests exhibit the following measurements:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	7.00	8.00	4.00 x 3.75	4.00 x 3.75	9.00 x 7.00	9.00 x 4.50	8.00 x 2.00	2.50 x 1.50
2.....	4.50	8.00	4.88 x 3.83	4.00 x 3.75	7.50 x 6.00	8.00 x 6.00	6.50 x 2.50	2.00 x 0.75
3.....	5.00	2.68	3.75 x 3.75	4.00 x 3.75	8.50 x 5.75	6.50 x 5.75	4.00 x 3.50	8.00 x 0.75
4.....	4.50	2.75	4.25 x 3.50	3.75 x 3.50	7.50 x 5.00	8.00 x 6.00	6.00 x 5.00	2.00 x 1.00
5.....	4.00	2.75	4.00 x 3.50	4.00 x 3.50	7.00 x 6.00	7.50 x 6.00	5.00 x 4.00	2.25 x 1.00
6.....	4.00	2.75	4.00 x 3.25	4.00 x 3.25	8.00 x 6.50	8.50 x 6.00	5.00 x 4.00	2.50 x 1.00
7.....	3.00	2.50	4.00 x 3.25	4.00 x 3.00	7.50 x 6.00	8.00 x 5.50	6.00 x 3.00	2.25 x 0.75
8.....	4.00	2.25	4.00 x 3.25	4.00 x 3.00	7.00 x 6.00	8.00 x 5.50	5.00 x 4.00	2.50 x 0.75
9.....	4.00	3.00	4.50 x 4.50	3.75 x 3.50	8.50 x 7.00	9.50 x 7.50	6.00 x 5.00	2.50 x 1.25
10.....	4.00	3.00	4.00 x 3.50	3.50 x 3.50	7.00 x 6.50	9.00 x 7.00	6.00 x 5.00	2.00 x 1.25
Average...	4.40	2.76	4.11 x 3.56	3.90 x 3.45	7.75 x 6.18	8.20 x 5.98	5.25 x 3.80	2.35 x 1.00

During the season of reproduction this species does not hesitate to attack even Crows and large Hawks, should they venture too near its breeding ground; and the harmless Mourning Dove, which nests often in close proximity to the Grackle, sometimes, indeed, in the same tree, is also very frequently thus persecuted.

FAMILY FRINGILLIDÆ. FINCHES, SPARROWS, ETC.

GENUS **CARPODACUS** KAUP.107. **Carpodacus purpureus** (GMEL.).**Purple Finch.**

Apparently very rare, the writer's only records being as follows: Two were seen flying across the Killbuck Valley, near Wooster, September 25, 1892; and four were observed singing in a swamp in about the same locality, on October 2, 1892.

A single male in the collection of Mr. George Faber was said to have been obtained about 1890.

GENUS **ACANTHIS** BECHSTEIN.108. **Acanthis linaria** (LINN.).**Redpoll.**

A very irregular winter visitor. This species has not been observed by the writer, and the only record available is that furnished by Mr. W. E. Henderson, who with reference to its occurrence writes as follows:—

"In regard to the Redpolls, the date I have marked is February 3, 1890. They were around for a month or so, and were quite abundant. I saw large flocks of several hundred; and they used to feed near our house in a field which was grown up with ragweed. I shot a number and carefully identified them at the time. Both in flight and note they resembled the Goldfinch, but could without great difficulty be distinguished."

GENUS **SPINUS** KOCH.109. **Spinus tristis** (LINN.).**American Goldfinch; Thistle-bird.**

A permanent resident; abundant except in winter. It is more or less gregarious at all times, though perhaps strictly speaking not so during the breeding season, yet small companies of four or five birds have even then been observed. It is present in apparently decreased numbers from about the middle of June until the middle of July, after which time it becomes as abundant as usual. It is very generally distributed, but seems during the nesting season to have some preference for the outskirts of towns and the vicinity of rural dwellings.

It nests commonly in ornamental trees, often in silver maples (*Acer saccharinum*). A nest found July 27, 1893, was situated in a large thistle near a stream, and among surroundings apparently much more suited to the Indigo Bunting than to the present species. Nest-building is usually begun late in July; the eggs, commonly five in number, being deposited early in August.

This species has been observed feeding upon the seeds of the dandelion (*Taraxacum Taraxacum*), wild lettuce (*Lactuca Canadensis*), common thistle (*Carduus lanceolatus*), rag-weed (*Ambrosia artemisiæfolia*), milkweed (*Asclepias Syriaca*) and common beg-

gar-ticks (*Bidens frondosa*). The fact that it feeds upon the last named would be, if extensively the case, sufficient reason for carefully protecting the Goldfinch; since this weed, especially on the bottom-lands, is exceedingly abundant and troublesome.

In this locality the American Goldfinch usually begins singing early in April, and continues in song until October, having been heard as late as October 19 (1892). The latest date of singing mentioned by Mr. Bicknell¹ is August 30.

GENUS **PLEOTROPHENAX** STEJNEGER.

110. *Plectrophenax nivalis* (LINN.).

Snowflake; Snow Bunting.

A winter visitor; apparently not present during very mild winters, though irregularly common in severe weather. It has been observed only in January and February, and not later than the twenty-fifth of the latter month. It occurs chiefly in flocks, occasionally in company with Horned Larks, and frequents both the uplands and the bottoms. A company of 125 Snowflakes was seen near Wooster, along the Pittsburg, Fort Wayne and Chicago R. R., February 25, 1893. The birds were very tame, and were apparently engaged in picking up small bits of cinders from the track.

GENUS **POOCÆTES** BAIRD.

111. *Poocætes gramineus* (GMEL.).

Vesper Sparrow; Grass Finch.

An abundant summer resident. It arrives not later than April 5, sometimes by March 18, and has been observed to remain until November 11 (1890).

It is to be found chiefly, though not exclusively, on the uplands, moving in small loose flocks during both spring and fall.

The breeding season continues from early in May until July; eggs having been taken between the dates of May 15 and June 26, inclusive. Four eggs seem to constitute the usual complement early in the season, but later on three is apparently a much more common number. Two broods are probably reared.

Three nests measured give the following results:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	2.00	1.50	2.75 x 2.65	2.90 x 2.80	5.00 x 4.65	4.75 x 4.50	4.75 x 4.00	1.75 x 0.50
2.....	2.50	2.00	2.50 x 2.25	2.38 x 2.12	4.50 x 4.25	3.75 x 3.00	2.25 x 2.25	1.00 x 0.63
3.....	2.50	1.50	2.50 x 2.25	2.38 x 2.12	3.75 x 3.50	.....	.....	.....
Average...	2.33	1.67	2.58 x 2.38	2.55 x 2.35	4.42 x 3.80	4.25 x 3.75	3.50 x 3.13	1.38 x 0.57

This species sings regularly from the time of its arrival until into August; subsequently somewhat sporadically even as late as October 18.

¹ Auk I, 1884, p. 329.

GENUS **PASSER** BRISSON.**112. Passer domesticus (LINN.).****European House Sparrow; English Sparrow.**

An abundant resident; very generally distributed throughout the County. It of course frequents preferably the streets of the towns, but is in very many places numerous in the farming districts, where it may be seen in the trees and shrubbery about the houses, also in orchards, hedges, and along the public roads.

Among its favorite resorts for breeding are the apple orchards its nests being built among the branches of the trees, in Woodpeckers' excavations, or in natural cavities such as the House Wren or Bluebird might select. It is in this section, as everywhere a great nuisance; in town nesting abundantly behind sign-boards, under the eaves, and in all sorts of nooks about the buildings. Nest-construction is sometimes begun in February, especially if the season be mild. Five eggs is a common complement.

The following account of its advent into Wayne County has been furnished the writer by Dr. J. H. Todd, of Wooster, and is given in his own words:—

"In the fall of 1876 a little troop of nine English Sparrows presented themselves in my yard, at once seemed at home, and assisted the chickens in disposing of their food. I was familiar with the Sparrow in New York, but they were a novelty in Wooster, none having been seen by any one, to my knowledge, in the County before. Many people came to see them, all supposing I had brought them; but I had not, and knew no more of where they came from than any of the numerous visitors that went to the yard to see them. In the spring they left as mysteriously as they had come. The next fall six came back, and from that time on the Sparrow was a permanent resident of Wooster.

GENUS **AMMODRAMUS** SWAINSON.SUBGENUS **PASSERCULUS** BONAPARTE.**113. Ammodramus sandwichensis savanna (WILS.).****Savanna Sparrow.**

A transient visitor; apparently rare, though in proper localities usually to be found in the spring. Not observed in the fall. It arrives about the middle of April, the sixteenth of this month being the earliest date recorded. It has been noted only on the meadows of the bottom-lands, where it frequents thickets, fence-rows, and the grass in the open fields. It is perhaps more common than the notes of the writer indicate.

SUBGENUS **COTURNICULUS** BONAPARTE.**114. Ammodramus savannarum passerinus (WILS.).****Grasshopper Sparrow; Yellow-winged Sparrow.**

A common summer resident. It arrives in May, usually about the middle of the month, though in 1892 it was noted May 1. It has not been observed later than August 20 (1893), and is not conspicuous after the first of this month.

The Grasshopper Sparrow is somewhat locally distributed, occurring, according to the writer's experience, only on the uplands, and there preferring fields of grass and clover. Many places, and even considerable areas of country where favorable conditions appear to exist, have been found untenanted by this species.

Although the nest has not been discovered, young in the streaked first plumage were taken in a field near Wooster, July 18, 1892.

This species sings regularly until late in July; in 1893 it was heard on the twentieth of August.

GENUS **ZONOTRICHIA** SWAINSON.

115. Zonotrichia leucophrys (FORST.).

White-crowned Sparrow.

A transient visitor; tolerably common from May 1 to May 24, but apparently rare in the fall. For the latter season the writer has only one record,—October 16, 1892. It is usually not seen in flocks, and does not commonly associate with any other species. It frequents the hedges, thickets and fence-rows, in fields and along the roads, also sometimes appearing on the outskirts of the towns.

116. Zonotrichia albicollis (GMEL.).

White-throated Sparrow.

An abundant transient visitor. It has been observed in spring from April 10 to May 17, and in fall from September 29 to November 8. It appears to be considerably more numerous in fall, during which season it moves in loose flocks, sometimes in company with Song Sparrows or Tree Sparrows; and may be found in almost any suitable locality. On October 5, 1890, eighty White-throated Sparrows were counted in a thicket within a radius of twenty-five feet.

This species is in song during both its spring and fall migrations, and has been heard singing until October 28; though the fall songs are not as a rule so well executed as those of spring.

GENUS **SPIZELLA** BONAPARTE.

117. Spizella monticola (GMEL.).

Tree Sparrow.

An abundant winter resident. It appears in fall usually before November, sometimes by the first of October, and departs generally about the middle of April, but lingered in 1892 until May 1.

It occurs principally in flocks of less than fifty individuals, along fence-rows, in thickets and weed-patches, and is especially numerous in the swamps on the bottomlands. It has been observed associated with the Junco, Field Sparrow, Vesper Sparrow and House Sparrow.

It cannot be considered in full song during any portion of its sojourn here, but nearly every spring some individuals may be heard singing. The perfect song has been noted as early as February 5 (1891). Less commonly is its song heard in the fall, having been noted on a few occasions only, from October 28 to November 13, inclusive.

118. *Spizella socialis* (WILS.).**Chipping Sparrow.**

An abundant summer resident. The first week in April is its usual time of arrival, but in 1894 it was first seen on March 21. It has not been observed later than October 16, and is sometimes apparently absent early in this month.

Nest-building is commonly begun during the first part of May, and birds have been seen carrying nest material as early as April 26 (1891). The latest date on which a nest with eggs has been observed is July 10 (1892). Where such are available the Chipping Sparrow seems to prefer for breeding purposes orchard trees or small ornamental evergreens, the nest being usually placed not more than twelve feet from the ground. Apparently two broods are ordinarily reared: four eggs, sometimes three, constitute the first complement; while three eggs, or not infrequently only two, is the number common during the latter part of the season.

Two nests measure as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	2.25	1.25	2.25 x 2.00	2.00 x 1.60	3.50 x 2.75	3.50 x 2.50	3.00 x 1.50	1.00 x 0.15
2.....	2.00	1.20	2.00 x 1.75	2.00 x 1.85	3.50 x 2.75	4.00 x 3.00	4.00 x 2.50	1.10 x 0.40

In autumn this species often collects into small flocks, frequenting then the fence-rows, thickets and the dryer portions of the swamps, at times associating with various species of Sparrows (including the ubiquitous *Passer domesticus*) and also occasionally with the Bluebird.

During June and July the Chipping Sparrow is often heard singing after dark, especially before midnight; and it is in spring one of the earliest singers of the morning. On May 22, 1890, it was first heard at 3:20 A. M.

119. *Spizella pusilla* (WILS.).**Field Sparrow.**

A summer resident; abundant. It appears generally during the first week in April, sometimes as early as March 25 (1894), and disappears commonly before the middle of October, the latest date on which it has been noted being October 16 (1891).

In spring and summer it is to be found chiefly in the fields on the uplands, then not in flocks; but in the fall it often in small companies frequents regularly also the thickets and weed-patches of the creek bottoms. During the latter season it associates commonly with the Chipping Sparrow, and also, though apparently less frequently, with several other species of *Fringillida*.

The present species breeds during May and June, along fence-rows, in thickets, on the edges of woodland, and in the vicinity of human dwellings; placing its nests usually in low bushes, often in those of the common wild blackberry (*Rubus villosus*).

The Field Sparrow sings from the time of its arrival until the latter part of July, not having been heard in song later than July 30 (1893).

GENUS **JUNCO** WAGLER.**120. Junco hyemalis (LINN.).**

Slate-colored Junco; Black Snowbird.

An abundant winter resident. It makes its appearance generally during the latter half of October, although it was in 1892 seen on October 2. It remains until late in April; latest in 1893, when it was noted on April 26.

It moves much in companies of from twenty to fifty individuals, seldom more, though a flock of eighty was encountered March 25, 1894. It is often found with other Sparrows, particularly Tree and Song Sparrows. Among its favorite haunts are the borders of the woods and the thickets on the bottom-lands, where during fall and winter the species may nearly always be found.

It usually sings to some extent during March and April, and its song has been heard even as early as February 25 (1892).

An albino specimen of this species, taken by Mr. W. E. Henderson, March 9, 1892, was, with the exception of a few isolated patches of color, entirely white.

GENUS **MELOSPIZA** BAIRD**121. Melospiza fasciata (GMEL.).**

Song Sparrow.

A permanent resident; very abundant except in December and January. In late fall and winter it retires principally to the bottom-lands, where often in small flocks it seeks the shelter of the dense thickets. At this time it feeds more or less extensively on the seeds of the ragweed (*Ambrosia artemisiæfolia*).

Nesting is begun in April, full complements of eggs having been taken on the third of May (1891). Nests with eggs have not been noted after June 14, but the species of course breeds considerably later than this date. Most of the nests observed have been in moist situations on the bottom-lands. A low bush is not infrequently utilized as a nesting place. The nest is usually very carefully concealed, sometimes being completely roofed over by growing grass. One found May 14, 1893, was located on the slope of a railroad embankment only a few inches beyond the ends of the ties and where the sitting bird was apparently disturbed by every passing train.

The measurements of six nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	2.75	1.75	2.50 x 2.18	2.50 x 2.25	4.50 x 3.25	4.25 x 4.00	3.50 x 2.75	1.25 x 0.88
2.....	2.50	2.00	2.63 x 2.50	2.38 x 2.25	5.00 x 4.25	4.00 x 3.25	2.75 x 2.00	1.50 x 0.25
3.....	2.50	1.75	2.50 x 2.50	2.63 x 2.25	4.50 x 3.75	.....	.....	.....
4.....	2.25	1.50	2.50 x 2.10	2.50 x 2.30	4.00 x 3.40	4.25 x 3.50	3.00 x 2.50	1.00 x 0.50
5.....	2.00	1.75	2.50 x 2.25	2.50 x 2.25	4.00 x 3.63	4.50 x 4.00	3.00 x 3.00	1.25 x 0.50
6.....	3.00	2.00	2.75 x 2.50	2.50 x 2.38	4.75 x 3.50	4.50 x 4.50	3.75 x 3.50	1.75 x 0.25
Average ...	2.50	1.79	2.66 x 2.33	2.50 x 2.28	4.46 x 3.63	4.30 x 3.85	3.20 x 2.75	1.35 x 0.38

The Song Sparrow has been heard singing in every month of the year excepting December, but the season of its best song is from about the first of March until the first of August, and from late in September to the latter part of October. The music

of this species seems to be of remarkable variability. Within a week's time the writer once identified some fifteen distinct songs, with almost endless variations; and the repertoire was apparently not then even approximately exhausted. Striking individuality was in some cases evinced, both in the quality as well as in the character of the music; the different birds being observed morning after morning at the same places along the road, singing so nearly the same songs that it became to a degree possible to recognize the several individuals by their peculiarities. Although strictly speaking a slight uncertainty might exist in regard to the fact of their being really the same birds which were heard thus day after day from particular fence posts or telegraph poles, as the case might be, yet the circumstances were such as to remove all reasonable doubt of their identity.

122. *Melospiza georgiana* (LATH.).

Swamp Sparrow.

A rare spring and fall transient, frequenting the swamps, marshes and water-courses. The writer has for this species but three records, which are as follows: October 5, 1890; May 3, 1891; and May 10, 1891; two individuals having been observed on each of these dates. It is perhaps of more frequent occurrence than is thus indicated, since it is given by Wheaton¹ as a common transient visitor.

GENUS *PASSERELLA* SWAINSON.

123. *Passerella iliaca* (MERR.).

Fox Sparrow.

A tolerably common transient visitor from March 18 to April 12, and from October 19 to October 31. It is observed chiefly in the undergrowth of wooded banks, and in thickets, particularly those on the borders of woodland. It moves often in small loose flocks; and occasionally associates with Tree Sparrows.

GENUS *PIPILO* VIEILLLOT.

124. *Pipilo erythrophthalmus* (LINN.).

Towhee; Chewink.

A common summer resident. The dates of its spring arrival range from March 18 (1894) to April 6 (1890); the male generally appearing a few days in advance of the female. It usually disappears soon after the middle of October, the latest date on which it has been observed being October 25 (1891).

This species may be found in the thickets of both the uplands and the bottoms, and also, though rather exceptionally, in the vicinity of human dwellings. Sometimes during the migrations it is seen in scattered companies of four or five individuals; but is seldom accompanied by birds of another species.

The breeding season is in May and June. The nest is occasionally found in a low bush; and not infrequently contains eggs of the Cowbird.

The Towhee may be heard in song soon after its arrival, and until the latter part of July, though it does not sing so steadily during this month. The date of latest song noted is July 27 (1893).

¹ Geological Survey of Ohio IV, 1882, p. 330.

GENUS **CARDINALIS** BONAPARTE.**125. *Cardinalis cardinalis* (LINN.).****Cardinal; "Red Bird."**

Resident throughout the year; abundant. Here almost universally known by the name of "Red Bird." It is most numerous in the thickets and the swamps on the bottom-lands, and in the many wooded ravines adjacent. It is, however, found regularly in suitable situations on the uplands, as well as in the door-yards and along the shaded streets of the towns. Although during the coldest weather evincing an apparent inclination to gather into the more sheltered locations, the species may, both winter and summer, be found in much the same situations. It is occasionally observed in company with other species, such as the Junco, Fox Sparrow, House Sparrow, and even the Robin.

Nest-building begins late in April, and eggs have been found until June 15, but the first three weeks of May seem to constitute the height of the breeding season. The nest is commonly well concealed in a bush or ornamental evergreen, and is usually less than ten, often but two or three, feet from the ground.

The measurements of three nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	5.25	2.00	2.88 x 2.75	2.50 x 2.50	6.50 x 5.00	5.25 x 4.75	4.00 x 3.50	1.50 x 0.50
2.....	4.00	2.50	3.50 x 3.00	2.75 x 2.50	6.50 x 5.50	4.50 x 4.50	3.75 x 2.25	1.75 x 0.75
3.....	3.50	1.75	2.50 x 1.88	2.25 x 1.75	6.00 x 5.00	8.00 x 5.50	5.25 x 4.75	1.50 x 0.75
Average...	4.25	2.08	2.96 x 2.88	2.50 x 2.25	6.33 x 5.17	5.92 x 4.92	4.33 x 3.50	1.58 x 0.69

The female, when flushed from the nest, leaves quietly, and ordinarily seeks to avoid subsequent observation. The well known propensity of this species to desert its breeding place upon slight provocation renders accurate observation upon the nest a matter of some difficulty. According to the writer's experience, a first visit, if due caution be exercised, will not usually result in abandonment, even should the female be in the vicinity at the time; but a second inspection is quite certain to result disastrously. A nest begun on April 28, 1891, was ascertained to contain two eggs on May 6; which data would determine the approximate period of its construction as five or six days. In all but one of the nests examined the maximum number of eggs has been two; the single exception containing three eggs, one of which was fresh, the others being five-eighths incubated (May 15, 1891). These circumstances suggest the possibility that other sets of two eggs, if allowed to remain a sufficient length of time, might have been augmented in a similar manner.

This species apparently sings little during the winter months, but begins to be heard usually about the later part of February,—the twenty-third of this month (1890) being the earliest record. The regular song period is carried well into August, after which time the singing is more or less intermittent, continuing, however, in some seasons until October 28.

The Cardinal is possessed of no mean imitative ability, of which, however, it does not seem to make frequent exhibition, and in regard to which little has apparently been written. On February 23, 1890, a male Cardinal was heard singing on one of the main streets of Wooster, but so closely did the song resemble in every respect the "purly, purly" of the Tufted Titmouse, that until the performer showed himself in plain sight and in the very act of uttering these notes, the belief that they proceeded from such a source was impossible. Similar remarks will equally apply to another Cardinal, which was very successful in reproducing the common call of the

Flicker—imitating it indeed so perfectly as to almost induce an erroneous note-book entry.

GENUS **HABIA** REICHENBACH.

126. *Habia ludoviciana* (LINN.).

Rose-breasted Grosbeak.

An abundant summer resident. Its spring arrival generally occurs during the first week of May April 28 (1891) being the earliest record. It remains until September, having been latest noted on the twenty-fourth of this month. It is found in suitable locations both on the uplands and on the bottoms, but is apparently most numerous represented on and near the latter.

The species was unusually abundant during the breeding season of 1890. In the months of May and June of that year there were found by the writer, without special search, within four miles of Wooster, twenty-two occupied nests; nearly three times the number recorded for any other year. Certain extensive thickets lying for some distance along both sides of the track of the Pittsburg, Fort Wayne and Chicago R. R., and adjacent to large swamps, seemed to have a special attraction for the birds, since here within a radius of fifty yards were found during that season eleven nests. The next year the same thicket yielded on careful search only three or four nests.

Eggs of this species have been noted from May 17 to July 10 (1892), but the latter date must be considered somewhat exceptional, as a large majority of the nests discovered have been between the twenty-fifth of May and the twelfth of June. The number of eggs is rather more commonly three than four, while five have been but once observed.

The nest is placed usually not over twelve, yet sometimes twenty feet from the ground; and while no particular preference appears to be shown, the thorn (*Crataegus*) is as frequently as any other bush chosen as its site. The nest is seldom found in an orchard, but one discovered June 12, 1892, was so situated. It is often located in a comparatively exposed position, with apparently no attempt at concealment; and is, moreover, occasionally so loosely constructed that the eggs may be counted from below. On June 5, 1892, a set of eggs was taken from the same bush—an elder (*Sambucus Canadensis*)—from which also the year previous eggs had been collected, possibly from the same pair of birds.

A series of ten nests exhibits the following measurements:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	8.50	2.25	3.00 x 3.00	2.75 x 2.75	6.00 x 4.50	5.00 x 4.50	3.00 x 2.25	1.75 x 0.13
2.....	3.25	1.50	3.25 x 2.75	2.75 x 2.25	5.50 x 4.50	4.50 x 4.50	2.00 x 2.00	2.00 x 0.13
3.....	3.25	2.00	3.25 x 3.00	2.75 x 2.75	6.00 x 5.50	6.00 x 5.25	4.00 x 3.00	2.50 x 0.75
4.....	3.50	1.75	3.38 x 3.00	2.75 x 2.63	6.50 x 4.75	7.00 x 6.00	5.00 x 2.00	2.00 x 0.38
5.....	4.50	1.50	3.00 x 3.00	2.63 x 2.63	6.50 x 5.50	7.00 x 5.00	4.50 x 4.00	2.00 x 0.38
6.....	3.50	2.00	2.83 x 2.75	2.83 x 2.63	5.00 x 4.50	5.50 x 5.50	7.00 x 3.00	1.63 x 0.63
7.....	3.50	2.00	3.25 x 2.75	2.75 x 2.63	6.00 x 4.75	6.00 x 4.50	5.00 x 2.00	2.00 x 0.50
8.....	2.75	1.88	3.13 x 3.00	2.75 x 2.63	6.00 x 5.00	6.00 x 5.00	5.50 x 3.50	2.00 x 0.50
9.....	3.25	1.75	3.25 x 2.88	2.83 x 2.75	4.75 x 4.25	7.50 x 7.00	7.50 x 7.00	1.00 x 0.25
10.....	3.25	1.75	3.25 x 3.00	3.00 x 2.75	5.50 x 4.75	4.75 x 4.00	3.50 x 3.50	1.50 x 0.31
Average...	3.43	1.84	3.16 x 2.91	2.79 x 2.64	5.78 x 4.80	5.98 x 5.13	4.70 x 3.23	1.81 x 0.45

The male apparently to a considerable extent shares the duty of incubation, for he has quite as frequently as the female been discovered on the nest. The sitting parent is not readily disturbed, often remaining until almost touched by the hand.

The Rose-breasted Grosbeak continues in song through May and June, but does not appear to sing much after the middle of July, its song not having been heard later than July 10 (1893).

This species has been observed in the latter part of July feeding upon the seeds of the milkweed (*Asclepias Syriaca*.)

GENUS **PASSERINA** VIEILLOT.

127. *Passerina cyanea* (LINN.).

Indigo Bunting.

A summer resident; ordinarily abundant, yet apparently not every year equally numerous. The earliest date of its spring arrival is April 24 (1892), though it does not usually appear until the second week in May. It remains until October, and while not observed later than the seventh of the month, this perhaps does not represent the limit of its stay.

The species is found on both the uplands and the bottoms, although it seems to be, at least locally, more abundant on the latter, where in late summer and in the fall it assembles into small flocks, frequenting then chiefly the thickets and patches of high weeds. At this time it is often associated with other Sparrows, particularly the Field Sparrow and the Song Sparrow. For a bird so common, its nests seem in this locality to be easily overlooked, since a large amount of careful searching has resulted in the discovery of but a single nest containing eggs, this being on June 22, 1890.

The song of this species may be heard from the time of the bird's appearance in spring until late in July, but it has not been detected later than July 30 (1893). On one occasion a male was observed singing on the wing, much after the manner of the Bobolink, continuing his song until in soaring flight he reached the ground.

GENUS **SPIZA** BONAPARTE.

128. *Spiza americana* (GMEL.).

Dickcissel; Black-throated Bunting.

A rare summer resident. Arrives in May, the third of the month being the earliest date recorded. It was not observed during 1893. The writer is informed by Mr. W. E. Henderson that this species was present in much more than ordinary numbers and was common during the summer of 1894. A nest containing four fresh eggs was taken by the same gentleman on July 8 of that year.

The Dickcissel is almost exclusively a bird of the upland fields, being very rarely noted anywhere on the bottom-lands, even in the spring.

FAMILY TANAGRIDÆ. TANAGERS.

GENUS *PIRANGA* VIEILLOT.129. *Piranga erythromelas* VIEILL.

Scarlet Tanager.

A common summer resident, but usually most numerous during the spring migration. The dates of its arrival vary from May 1 to May 7, and it lingers in fall usually until late in September, being in 1890 last observed on October 3.

The breeding season begins about the middle of May, completed nests having been noted on the twenty-second of this month. It is exceptional to find other than incubated eggs after the middle of June. While a woodland situation is commonly chosen, an orchard tree is not infrequently the nesting site, particularly if the orchard be in proximity to a tract of woods.

The measurements of four nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	8.00	1.75	2.75 x 2.50	2.25 x 2.25	5.50 x 4.00	6.00 x 4.50	3.50 x 2.50	2.25 x 0.50
2.....	8.00	1.75	2.25 x 2.25	2.25 x 2.25	4.25 x 3.50	5.00 x 4.00	3.75 x 3.25	1.00 x 0.35
3.....	2.00	1.25	2.50 x 2.25	2.25 x 2.10	4.25 x 3.50	5.25 x 3.75	3.75 x 2.75	1.25 x 0.50
4.....	3.50	2.00	3.00 x 2.50	3.00 x 2.45	6.00 x 4.25	5.50 x 4.50	4.00 x 3.50	1.80 x 0.50
Average	2.88	1.69	2.68 x 2.38	2.44 x 2.26	5.00 x 3.81	5.44 x 4.19	3.75 x 3.00	1.58 x 0.46

This species is a frequent nurse of the Cowbird, and often when the egg of this imposter is present only two or three eggs of the Tanager are deposited. In fact, one nest that was carefully watched from the time of its construction until incubation of the eggs was nearly half completed, contained but one egg of its owner and one of the Cowbird.

The Scarlet Tanager begins to sing soon after its arrival, and continues in song until late in July. It has not been heard subsequent to the twenty-seventh of this month.

FAMILY HIRUNDINIDÆ. SWALLOWS.

GENUS *PROGNE* BOIE.130. *Progne subis* (LINN.).

Purple Martin.

An abundant summer resident. It makes its spring appearance generally between the first and the eighth of April, though in 1892 it was seen on March 25. It usually disappears during the latter part of August or the first days of September; a solitary individual, however, was noted on September 20, 1893.

A Martin box on one of the main streets of Wooster is every spring regularly preempted by the House Sparrows before the arrival of the rightful tenants. The

Martins appear to be in this case more than a match for the Sparrows, for after a contention lasting rarely more than three or four days, always succeed in effectually expelling the intruders.

The first brood of young is hatched some time during the latter part of May, and the second about four or five weeks later. After the young of the earliest brood leave the nest—which event occurs ordinarily about the middle of June—the Martins every year congregate almost daily in the main streets of Wooster, roosting at night chiefly under the eaves of the higher buildings, wherever suitable places are available. These gatherings vary from ten to one hundred birds, reaching their maximum size in the latter part of July and the first part of August, after which time they gradually diminish. They are at first to a large extent composed of young birds and adult males. Until August the birds are observed to alight principally on the telegraph wires and the cornices of the higher buildings, but subsequently they appear to much prefer the court-house and its tall weathervaned tower. They are most active between sunset and dark, and their cackling cry may at this hour be almost incessantly heard. They grow somewhat less noisy as the season advances, but so long as they remain do not usually become entirely silent.

The Martin is one of the first birds astir in the morning, and in May its note is frequently to be heard by half-past three o'clock.

This species has been seen to pursue and to all appearances greatly annoy the Redtailed Hawk, but for just what purpose was not apparent.

GENUS **PETROCHELIDON** CABANIS

131. Petrochelidon lunifrons (SAY).

Cliff Swallow.

A common summer resident, but very locally distributed during the breeding season. It arrives between the middle of April and the first of May, the earliest date being April 16 (1893). It seems to practically disappear early in August, and has not been observed later than the twenty-fifth of this month (1890). It has been observed associated with no other species save the Barn Swallow.

Only one breeding colony of any considerable size has been noted; this having been tenanted continuously for a number of years.

Incubation of the first complement of eggs begins about the middle of May; of the second about five weeks later.

GENUS **CHELIDON** FORSTER.

132. Chelidon erythrogastra (BODD.).

Barn Swallow.

An abundant summer resident. It arrives usually about April 20, but in 1893 was first seen on April 9. It remains until late in August, not, however, having been noted after the twenty-fifth of this month.

The breeding season begins about the middle of May, and commonly continues until July, two broods being probably reared.

On June 17, 1891, there was discovered in a barn the remains of a nest that had fallen from the side of the rafter to which it had been secured; this accident having of course resulted in the death of the young birds. The parents, nothing daunted, were constructing a second nest in exactly the same location, and on July 1 the female was found sitting upon two incubated eggs.

Two nests of this species present the following measurements :

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	4.00	1.50	3.00 x 2.83	2.50	5.25 x 3.50	5.00 x 3.00	4.00 x 1.50	1.50 x 0.25
2	2.00	1.50	3.00 x 2.50	2.00	4.50 x 3.00	.....	4.00 x 2.50	.....

The wires of the telegraph lines afford of course favorite places of rendezvous for this, as well as other species of Swallows, and it is no unusual occurrence to see a whole brood of young marshalled upon the wires, while the parent birds busily engage themselves providing food for the voracious appetites of their offspring. The habit these Swallows have, of at times fluttering along close to the surface of a small pond, instead of skimming swiftly over, gives them more the appearance of huge butterflies than of birds, and is an interesting performance.

The Barn Swallow is more or less gregarious even during at least a portion of the breeding season, but is most noticeably so in the months of July and August. At this time companies of fifty individuals are commonly encountered, and on July 27, 1893, a flock of 300 was observed.

In the spring of 1891 a perfect albino of this species was secured from among a number of other Barn Swallows, by Mr. E. N. Freeman, of Orrville. By reason of the inconsiderable development of the tail feathers the specimen was presumed to be a female. It was nearly pure white, the only observable diagnostic character of the plumage being the normal white tail markings, made discernible by the somewhat more dusky appearance of the remaining portions of the rectrices.

GENUS **TACHYGINETA** CABANIS.

133. **Tachycineta bicolor** (VIEILL.).

Tree Swallow.

A very rare summer resident; somewhat more common during the spring migration, but not observed in the fall. It seems to be quite irregular and very few records are available. Its earliest appearance was noted in 1893, when six were seen on April 9. On May 15, 1892, a flock of 100 and another of 85 were observed on the bottoms near Wooster, but other than this never more than six have been seen on any one date. It has only twice been noticed in summer: on June 14, 1891, and on July 17, 1892.

GENUS **STELGIDOPTERYX** BAIRD.

134. **Stelgidopteryx serripennis** (AUD.).

Rough-winged Swallow.

A common summer resident. The dates of its spring arrival range from April, 8 to April 21. It was observed latest in 1890, when it was seen on August 24.

During the summer it is confined principally to the bottom-lands, where usually, but not always, it breeds in the immediate vicinity of running water. Nesting begins

late in May or early in June, and the complement of five or six, rarely seven, eggs is generally completed between the first and the fifteenth of the latter month. The nest is situated either in a convenient crevice of a stone culvert or bridge abutment, or else in an excavation in the perpendicular face of the bank of a creek. When the last location is selected, the length of the burrow ranges from twenty to sixty inches. This passage has an average diameter of three and one-half inches, but is somewhat enlarged at the nest, which is placed three to eighteen inches from its inner extremity. This latter distance does not seem to be proportionate to the length of the burrow, but varies indefinitely.

The composition of the nest includes straw, grass and weedstalks; and its lining consists of fine grass, small leaves of some species of willow, with sometimes the stalk leaves of wheat or other similar grain, but no feathers of any description. The willow leaves have been present in all the nests examined, and seem to be a characteristic feature. The nest is loosely constructed, and is sometimes quite-bulky.

Five nests afford the following measurements:

No.	Height.	Depth.	Inside top diameter.	Outside top diameter.	Outside bottom diameter.	Width of rim.
1.....	2.50	1.25	2.50 x 2.25	8.50 x 4.34	7.50 x 4.00	3.00 x 0.25
2.....	2.00	0.75	2.75 x 1.75	7.00 x 3.50	.....	.....
3.....	2.50	1.25	2.50 x 2.00	6.50 x 4.50	.....	.....
4.....	2.75	1.25	2.50 x 2.25	7.00 x 4.50	10.00 x 4.50	2.00 x 0.88
5.....	3.00	1.25	2.62 x 2.50	6.00 x 5.00	.....	.....
Average.....	2.55	1.15	2.58 x 2.15	7.00 x 4.7	8.75 x 4.25	2.50 x 0.57

As will be noticed, the maximum outside bottom diameter is sometimes much greater than that at the top, but this is partially accounted for by the fact that the lower portion of the nest is often so loose that anything like accurate measurement is practically impossible. The frequent great difference between the extremes of similar outside dimensions of the same nest is of course due to the greater possibility for extending the nest longitudinally in the passage.

A nest despoiled of its contents in 1891 was the next year tenanted by possibly the same pair; but this is apparently an exceptional occurrence, since the same breeding place is rarely occupied two years in succession. The incubating female is without difficulty induced to fly out, a stick thrust into the passage generally proving immediately effective, though sometimes the bird withdraws into the burrow beyond the nest.

FAMILY AMPELIDÆ. WAXWINGS, ETC.

SUBFAMILY AMPELINÆ. WAXWINGS.

GENUS AMPELIS LINNÆUS.

135. *Ampelis cedrorum* (VIEILL.).

Cedar Waxwing.

Irregularly abundant; probably a permanent resident, though rarely observed during the winter months. It is generally seen in flocks, except during the breeding season; but is seldom associated with other species.

Nest-building is begun sometimes by the first of June, and the four or five young are usually well fledged by the middle of July. Most of the nests observed have been situated in apple orchards.

FAMILY LANIIDÆ. SHRIKES.

GENUS LANIUS LINNÆUS.



NORTHERN SHRIKE, REDUCED.

136. *Lanius borealis* VIEILL.

Northern Shrike ; Butcher-bird.

A tolerably common winter resident. It is probably present every year, although in apparently somewhat irregular numbers. Specimens in the writer's collection were taken on November 5 and December 26, 1892.

137. *Lanius ludovicianus excubitorides* (SWAINS.).

White-rumped Shrike.

A tolerably common summer resident from March 25 to September 21. It seems to be more frequently observed on the bottoms, though occurring also on the uplands.

Two nests taken were situated in a moist meadow along Killbuck Creek. They were respectively four, and four and one-half feet from the ground, and quite well concealed both being placed in thorn bushes (*Crataegus*). The materials consisted of twigs of the thorn bushes, weedstalks, grass and straw; with a neat lining of fine grass, gray vegetable fibres, moss and cattle-hair. One of these nests was taken June 7, 1890, and contained five eggs, which were three-eighths incubated; the other on May 29, 1892, and contained six eggs, in which incubation was one-eighth advanced.

The measurements of these two nests are as follows:

No.	Height	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	4.50	3.00	3.00 x 2.75	3.00 x 2.75	5.50 x 4.50	6.00 x 4.00	4.00 x 2.00	2.00 x 0.75
2.....	6.00	3.00	3.50 x 2.75	3.25 x 3.12	7.00 x 5.50	6.00 x 5.50	5.50 x 5.00	1.75 x 0.63

Mr. W. E. Henderson mentions the discovery of a nest containing seven eggs, which seems sufficiently unusual to be worthy of record.

The breeding Shrikes of this County are intermediate between *Lanius ludovicianus* and *L. ludovicianus excubitorides*, but judging from the specimens examined, they appear on the whole to most closely approach the latter, and may, at least for the present, stand as such.

FAMILY VIREONIDÆ. VIREOS.

GENUS VIREO VIEILLOT.

SUBGENUS VIREOSYLVA BONAPARTE.

138. *Vireo olivaceus* (LINN.).

Red-eyed Vireo.

A common summer resident. Its spring arrivals, as noted, are from May 3 to 15, inclusive. The latest fall date is October 3 (1891), but the species generally disappears in September.

It affects both the uplands and the lowlands, but is for the most part confined to the woods, breeding preferably in the timbered ravines and near the borders of the forests.

The Red-eyed Vireo sings steadily from the time of its arrival until about the middle of August, and thereafter more or less intermittently usually as long as it remains, the latest song date being October 3 (1891).

139. *Vireo gilvus* (VIEILL.).

Warbling Vireo.

An abundant summer resident; somewhat more numerous at the time of the spring migration. It appears ordinarily during the first week of May, and remains until late in September. Extreme dates are April 28, 1891, and October 2, 1892.

In most situations excepting the woodlands, the present species, particularly during the breeding season, replaces to a great extent the Red-eyed Vireo. It occurs most commonly along the sparsely timbered portions of the streams, as well as in the vicinity of rural dwellings and the well shaded streets of the towns.

The nesting season is initiated during the latter part of May, and eggs may be obtained at almost any time in June. The breeding place preferred seems to be an apple orchard, and the nest when thus located is usually from four to twenty feet from the ground, but elsewhere is commonly at an altitude of between twenty-five and forty feet. Aside from orchard trees, nests have been detected in maples (*Acer rubrum*), in wild cherry trees (*Prunus serotina*) and in willows.

The measurements of three nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	2.00	1.60	1.88 x 1.88	1.88 x 1.88	3.38 x 2.88	3.50 x 3.00	2.75 x 2.00	1.00 x 0.88
2.....	2.50	1.60	2.00 x 1.75	2.25 x 2.00	2.88 x 2.88	3.68 x 2.75	1.75 x 1.88	0.56 x 0.06
3.....	2.25	1.65	2.25 x 1.75	2.20 x 2.05	3.10 x 2.50	3.15 x 2.50	1.50 x 1.25	0.50 x 0.80
Average..	2.25	1.55	2.04 x 1.79	2.11 x 1.94	3.12 x 2.59	3.43 x 2.75	2.00 x 1.54	0.69 x 0.25

A nest discovered on June 26, 1892, in an almost inaccessible position in an apple tree, was ascertained to contain nearly fledged young. One of these had by accident become entangled in some of the external fibres of the nest, and having fallen, hung suspended by the feet. This was indeed a very unfortunate position for the fledging, and we undoubtedly earned its gratitude by affording it the relief which it had been of course unable to obtain from its anxious parents.

The Warbling Vireo sings regularly until about the first of August, and subsequently, though less frequently, until into September, the latest date of song heard being in 1892, on September 23. This species has a curious habit of most unconcernedly singing although its home be quite closely approached, and it sometimes continues its song even while its nest is in process of being removed.

SUBGENUS **LANIVIREO** BAIRD.

140. **Vireo flavifrons** VIEILL.

Yellow-throated Vireo.

Tolerably common as a summer resident, but most numerous in spring, arriving ordinarily between the first and the seventh of May. It has not been observed later than July 28 (1892), but it probably remains until at least the middle of August. It is confined principally to the tall timber, being found on both the uplands and the bottoms.

It may be heard in song from the time of its appearance in spring until the latter part of July. Its silence after the first of August perhaps accounts for its having escaped any subsequent notice, since it is much oftener heard than seen.

FAMILY **MNIOTILTIDÆ**. WOOD WARBLERS.

GENUS **MNIOTILTA** VIEILLOT.

141. **Mniotilta varia** (LINN.).

Black and White Warbler.

A common spring transient and very rare summer resident. It makes its appearance between the first and the fifteenth of May, and during the spring migration frequents the woods on both the uplands and the bottoms, being often associated with other Warblers. In summer it has been noted principally in the wooded ravines adjoining the lowlands.

GENUS **HELMINTHOPHILA** RIDGWAY.

142. **Helminthophila pinus** (LINN.).

Blue-winged Warbler.

A rare summer resident; somewhat more numerous in spring, arriving between the first and the tenth of May. It is seldom seen on the uplands, but affects chiefly the thickets of the bottoms. Owing no doubt to the character of the localities frequented, it is generally heard rather than seen.

143. *Helminthophila peregrina* (WILS.).**Tennessee Warbler.**

A spring and fall transient; tolerably common, though somewhat irregular. It has been observed in spring between May 15 and May 24; in fall from September 21 to October 7. It was most numerous during the spring of 1892. It frequents thickets and woodlands generally, being found often in company with other Warblers. Its song is heard quite regularly during the spring migration.

GENUS *DENDROICA* GRAY.**SUBGENUS *PERISSOGLOSSA* BAIRD.****144. *Dendroica tigrina* (GMEL.).****Cape May Warbler.**

A transient visitor; apparently rare in spring, but tolerably common in the fall, though of rather local occurrence. In the spring it has been only once seen,—on May 6, 1892; but in the autumn it has been observed from September 25 to October 7. It appears to somewhat prefer the lowlands, and has been chiefly noted in the valley of the Killbuck, usually near the stream, in thickets and the less, heavily wooded portions of the forests.

SUBGENUS *DENDROICA* GRAY.**145. *Dendroica æstiva* (GMEL.).****Yellow Warbler.**

An abundant summer resident. Its spring arrival has been usually between April 21 and April 25, and it generally remains until September, not, however, having been noted later than the seventh of this month. It is apparently more numerous on the bottoms than on the uplands.

Thickets along streams seem to furnish the most acceptable nesting sites, and in this locality a decided preference is shown for the elders (*Sambucus Canadensis*), much the greater number of nests found being situated in these bushes.

The three eggs of a set (containing also one egg of the Cowbird) taken May 29, 1891, are somewhat peculiar in pattern of coloration, and exhibit considerable difference in size. The ground color is greenish white; in one of the eggs almost immaculate, with near the larger end a very few minute dots of clove brown and dull lilac and one long streak of clove brown. A second egg is similar to the one described, but is slightly more heavily marked, though much less so than is usual in eggs of the species. The other egg is thickly marked,—but still somewhat less so than average specimens—with small spots of fawn color, drab and dull lilac, these being in a broad zone about the central portion of the egg. These eggs measure respectively: .70 x .52, .71 x .52, .62 x .44.

The height of the breeding season is apparently between the middle of May and the first of June, as a large proportion of the nests found contained, or evidently had contained, unincubated eggs during this period. Incompleted nests have been noted by May 11 (1890), and eggs have been found as late as June 22 (1891).

Eight nests exhibit the following measurements :

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outsidetop diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	3.50	1.63	2.00 x 1.70	2.00 x 1.75	2.75 x 2.44	2.75 x 2.50	1.50 x 1.50	0.50 x 0.25
2.....	3.50	1.63	1.88 x 1.63	1.88 x 1.88	3.50 x 2.75	3.00 x 3.00	2.50 x 2.50	1.12 x 0.63
3.....	3.63	1.88	1.63 x 1.50	2.00 x 1.75	2.75 x 2.50	2.88 x 2.63	1.63 x 1.25	0.63 x 0.25
4.....	3.00	1.50	1.88 x 1.75	1.95 x 1.88	2.88 x 2.50	2.75 x 2.63	2.25 x 1.00	0.50 x 0.25
5.....	2.50	1.50	2.00 x 1.88	2.60 x 1.75	3.25 x 2.25	3.75 x 3.00	2.25 x 1.75	0.56 x 0.19
6.....	2.00	1.20	1.85 x 1.65	2.10 x 1.95	2.90 x 2.50	3.50 x 3.00	3.00 x 2.00	0.85 x 0.35
7.....	3.25	1.25	2.00 x 1.70	2.10 x 2.05	2.65 x 2.15	3.25 x 2.50	2.75 x 1.00	0.50 x 0.20
8.....	2.15	1.50	1.85 x 1.60	2.15 x 2.00	2.85 x 2.65	2.75 x 2.75	2.50 x 2.00	0.75 x 0.35
Average	2.94	1.45	1.89 x 1.68	2.02 x 1.88	2.94 x 2.47	3.03 x 2.75	2.30 x 1.70	0.68 x 0.31

This species sings very persistently for the first few weeks after its advent in spring, and quite regularly up to about the beginning of July, continuing more or less intermittently until the last of this month. The latest song was recorded in 1891, on July 28.

146. *Dendroica caerulescens* (GMEL.).

Black-throated Blue Warbler.

A common transient visitor; much more numerous in spring than in fall. It is however, somewhat irregular in numbers, being decidedly less frequent in some seasons than in others. It appears usually during the first few days of May, and remains for two or three weeks. It lingered late in 1892, being last observed on June 1. The earliest record of its arrival is April 23 (1893).

It has been noted in the fall on but two occasions,—October 5, 1890, and September 18, 1892. On the latter date one was seen singing. The Black-throated Blue occurs with other of the Warblers in the thickets and woods of both the uplands and the bottoms.

147. *Dendroica coronata* (LINN.).

Myrtle Warbler.

An abundant transient visitor; somewhat more numerous in fall than in spring. It has been observed as early as April 16 (1893), but does not usually appear until several days later. It remains until about May 22. In autumn it has been noted from September 25 to November 6. The lowlands along the creeks seem to be favorite resorts for this species, and during the fall it may there be found often in small flocks. With the possible exception of *Dendroica striata* the Myrtle Warbler is by far the most numerous of the transient species of the family.

148. *Dendroica maculosa* (GMEL.).

Magnolia Warbler.

A transient visitor; one of the less frequent species. It is sometimes tolerably common, but has been observed only between May 11 and May 22. It is apparently

of most regular occurrence in the thickets bordering woodlands and in the undergrowth of the forests.

149. *Dendroica cærulea* (WILS.).

Cerulean Warbler.

Rare; probably occurring solely as a transient visitor. It was noted only in 1891, when on May 8 an adult male was shot and two other individuals were seen. Another was observed on May 10, and one also on May 15. These were all apparently in full song, and had not this been the case, would have passed unnoticed amid the multitudes of migrant Warblers which at this season throng the tops of the forest trees in the valley of the Killbuck.

150. *Dendroica pensylvanica* (LINN.).

Chestnut-sided Warbler.

A tolerably common transient from May 14 to May 20. It is also a very rare summer resident, but has not been observed in the fall. The only summer records are for 1893, in which year one of these birds was, on July 9, seen singing in the woodland of the Killbuck Valley, at a locality about four miles northwest of Wooster. On July 10 and 16 of the same year, a Chestnut-sided Warbler, quite probably the former individual, was again heard in the same vicinity.

The species frequents almost exclusively the woodlands, moving among the branches of the highest trees, and also, though apparently less preferably, in the low undergrowth.

151. *Dendroica castanea* (WILS.).

Bay-breasted Warbler.

A very rare transient visitor. The only dates for this species are May 22 and 24, 1892. The birds seen were in rather open woodland, in the lower portions of the trees, and were without difficulty closely approached.

Although Wheaton mentions¹ this species as occurring "in great numbers" in fall, the writer has strangely enough failed to detect it during that season. Many Black-poll Warblers have been shot in the hope of securing specimens of *D. castanea*, as the latter might of course, if not captured, readily pass for *D. striata*.

152. *Dendroica striata* (FORST.).

Black-poll Warbler.

An abundant fall transient, but seen during the spring season only in 1892, when it was common from May 21 to May 30. In the autumn it has been observed from September 18 to October 16. It may be found almost wherever there are trees or bushes, and in the streets of the towns is, of all the transient Warblers, the one most frequently occurring, and the species most numerously represented. It is seen occasionally in small straggling companies, consisting, however, of rarely more than six or seven individuals.

¹Geological Survey of Ohio IV, 1882, p. 255.

153. *Dendroica blackburniæ* (Gmel.).**Blackburnian Warbler.**

Although Wheaton considers¹ this bird an abundant transient in the vicinity of Columbus, it is seemingly very rare in Wayne County. Only three individuals have been noted; two on May 20, 1890, and one on May 20, 1892. It is possibly more common than is thus indicated.

154. *Dendroica virens* (Gmel.).**Black-throated Green Warbler.**

A common spring transient from May 1 to May 22. It is apparently rare in the fall, as there is available but one record for that season: October 4, 1891. It may be found in the woods of both the uplands and the bottoms, and there its very distinctive song may be heard almost any day during its spring migration.

GENUS *SEIURUS* SWAINSON.

OVEN-BIRD, NATURAL SIZE.

155. *Seiurus aurocapillus* (Linn.).**Oven-bird; Golden-crowned Thrush.**

A rare summer resident. It is for a while in May common in certain localities, especially in portions of the Killbuck Valley, where at this season it occurs associated with the next species. It arrives early in May, and remains until the middle of October (May 1 to October 16). It has seldom been noted on the bottom-lands except during the migrations, since it retires for the summer to the most secluded portions of the upland forests.

156. *Seiurus motacilla* (Vieill.).**Louisiana Water Thrush.**

Rare summer resident. A certain portion of the valley of the Killbuck, lying between four and five miles northwest of Wooster, is the only locality where this species has in summer been observed, and although it there probably breeds, its nest has not been discovered. In this place the species is usually common for a few days in spring, frequenting the woods and thickets along the creek, together with the many mossy ravines in the adjacent woodland. It has been in spring occasionally

¹Geological Survey of Ohio IV, 1882, p. 252.

noted in swamps in other portions of the Killbuck Valley, but no other spot seems to be quite so congenial as the one above mentioned.

This Warbler arrives usually late in April, the twenty-first of the month (1891) being the earliest date recorded. It has not been observed later than July 28 (1892). It is generally in full song at the time of its spring appearance, and for a season its notes form one of the characteristic bird melodies of its favorite haunts.

GENUS **GEOTHYLPIS** CABANIS.

SUBGENUS **OPORORNIS** BAIRD.

157. **Geothlypis agilis** (WILS.).

Connecticut Warbler.

A very rare transient visitor. The only record is a single specimen taken October 2, 1892.

SUBGENUS **GEOTHYLPIS** CABANIS.

158. **Geothlypis philadelphia** (WILS.).

Mourning Warbler.

Apparently a very rare transient visitor. It has been positively identified but once,—on May 14, 1893, when a single adult male was found in the thick undergrowth of the woodland along Killbuck Creek, about four miles northwest of Wooster.

159. **Geothlypis trichas** (LINN.).

Maryland Yellow-throat.

An abundant summer resident. The dates of its appearance range from April 23 to May 7; and it is present generally until the first of October, although less numerous during September. Dr. Wheaton¹ writing probably with regard to the vicinity of Columbus, says that this species "remains until the first of September."

It is more common on the bottoms than on the uplands, and though of course a bird of thickets and fencerows, it sometimes wanders away from both. On July 2, 1891, a Maryland Yellow-throat was heard singing in the midst of a large wheat-field, where there seemed nothing to attract it from the presumably more suitable localities in the neighborhood.

The song of this species continues throughout the whole of the bird's summer sojourn, but is more irregular during September and the latter part of August. The date of latest song heard (October 2, 1892,) is coincident with the latest record for the species. In spring it is one of the early morning singers, being often among the first species heard. On May 27, 1890, it was singing at 3:35 A. M.

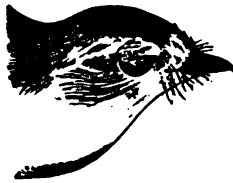
¹Geological Survey of Ohio IV, 1882, p. 275.

GENUS **ICTERIA** VIEILLLOT.**160. Icteria virens (LINN.).****Yellow-Breasted Chat.**

A rare summer resident. It has not been noted earlier than May 17, nor later than August 3, but probably neither of these dates represents the extreme of its presence here.

This species on the uplands frequents the woods and the dense thickets, but on the bottoms is confined apparently to the latter. A nest taken by Mr. J. Hine, near Wooster, June 17, 1893, contained five eggs, two of them, however, being those of the Cowbird. The nest was situated in a hickory sapling in underbrush near the edge of woodland.

Although much has been written concerning the vocal powers of the Yellow-breasted Chat, little attention seems to have been called to its ability for mimicry; yet nevertheless, besides being a wonderful ventriloquist, it manifests at times a remarkable imitative faculty. The different notes of the Robin, Catbird, Brown Thrasher, together with those of many other species, including even the croak of the Green Heron, are all reproduced so faithfully that one begins to wonder whether after all the thicket contains not a number of birds instead of a single Yellow-breasted Chat. It seems, however, that such an exhibition is more rarely given than its ordinary vocal performance. This species has been found in full song on July 4, but later in the season has not been heard singing.

GENUS **SYLVANIA** NUTTALL.

WILSON'S WARBLER, NATURAL SIZE.

161. Sylvania pusilla (WILS.).**Wilson's Warbler.**

A rare transient visitor. Observed in spring from May 22 to June 1, but in autumn only on September 18, 1892. It has been noted principally in thickets along streams, and in the undergrowth of woodland. It is in full song during its spring passage, and its notes constitute a pleasing warble, in part somewhat suggestive of the song of the House Wren.

GENUS **SETOPHAGA** SWAINSON.**162. Setophaga ruticilla (LINN.).****American Redstart.**

A very rare summer resident, though common as a spring transient. It appears usually during the first week of May, the earliest date being April 30 (1891). It frequents the woods of both the uplands and the bottoms; being often associated with other species of Warblers. It has been observed in summer on but one occasion,—July 27, 1893.—and has been entirely overlooked in the fall. It is generally in song upon its arrival in spring; and was heard singing on July 27.

FAMILY **TROGLODYTIDÆ**. WRENS, THRASHERS, ETC.SUBFAMILY **MIMINÆ**. THRASHERS.GENUS **GALEOSCOPTES** CABANIS.**163. Galeoscoptes carolinensis (LINN.).****Catbird.**

An abundant summer resident from April 26 to October 2.

The numerous and extensive thickets on the bottom-lands seem to afford particularly favorable nesting sites, since it is there that during the breeding season this species occurs most abundantly. The nests are seldom higher from the ground than six feet, and by far the greater number of those found have been but three and one-half feet or less; but almost always carefully concealed. When the situation is, as occasionally chosen, an orchard, the nest is generally at least twelve or fourteen feet from the ground and in the upright fork of a limb. The lining of the nest was ascertained to be in nearly every case entirely of dark-colored roots, the only exceptions containing in addition a small quantity of grass and weedstalks. Three or four eggs generally constitute a complement; five having been but twice recorded. Occupied nests have been noted from May 14 to June 26.

The Catbird sings very continuously from the time of its arrival until August, and subsequently more or less intermittently until September. The latest date of song heard is September 18 (1892).

GENUS **HARPORHYNCHUS** CABANIS.SUBGENUS **METHRIOPTERUS** REICHENBACH.**164. Harporhynchus rufus (LINN.).****Brown Thrasher.**

A common summer resident. It appears sometimes by April 1, though not infrequently several days later. Not observed in fall after September 17 (1893).

The breeding season continues from the first of May until about the first of July, but nests with eggs are rarely to be found subsequent to the middle of June. The usual nesting site is a brush-heap or a sheltered thicket; a location offering good opportunity for concealment being apparently preferred.

The two nests measured present the following dimensions:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width o rim.
1.....	3.50	1.75	4.00 x 3.00	3.50 x 2.75	6.50 x 6.00	7.00 x 7.00	5.00 x 4.00	2.50 x 0.75
2.....	4.00	2.00	4.25 x 4.00	3.75 x 2.75	7.50 x 6.50	6.00 x 5.50	5.00 x 4.50	1.50 x 0.50

This species sings quite regularly until into July, but has not been heard in song after than the thirtieth of this month.

SUBFAMILY TROGLODYTINÆ. WRENS.

GENUS **THRYOTHORUS** VIEILLOT.

SUBGENUS **THRYOTHORUS.** -



CAROLINA WREN, REDUCED.

165. **Thryothorus ludovicianus** (LATH.).

Carolina Wren.

A common permanent resident; somewhat less numero is in winter. While perfectly at home in the towns, it seems to be partial to the bottom-lands and to the

wooded ravines,—the thickets and swamps along the streams being particularly suitable for its habitation.

A nest visited on May 6, 1890, contained five fully fledged young. This nest was situated in a small barn in the town of Wooster, being placed on the bare floor of a hay loft, close against the side of the building; thus being completely hidden from the outside, though plainly visible from within. The birds entered the nest through a knot-hole in the weather-boarding, but were very shy when conscious of being observed. For some unknown reason, the nest, while containing young, was removed from the loft and placed upon the ground outside, where, however, the parent birds continued their attentions until the young were able to fly.

The Carolina Wren has been observed in song during every month of the year with the exception of December, and it sings with apparently as much vivacity in zero weather as during the most pleasant days of spring.

GENUS **TROGLODYTES** VIEILLOT.

SUBGENUS **TROGLODYTES.**

166. **Troglodytes aedon** VIEILL.

House Wren.

A common summer resident. It appears late in April or early in May, and remains sometimes until October 16, though is unusual after October 1. During the breeding season the apple orchards, even though not adjacent to human habitations, seem to be its favorite resorts.

The House Wren sings from the time of its arrival until about the first of August, but less continuously during the greater part of July. The date of latest song heard is July 30 (1893).

SUBGENUS **ANORTHURA** RENNIE.



WINTER WREN, SLIGHTLY REDUCED.

Troglodytes hiemalis VIEILL.

Winter Wren.

A rare winter resident; tolerably common during the spring and fall migrations. It has been observed from September 27 to May 15, principally along fencerows, in thickets and in woodland undergrowth.

GENUS **CISTOTHORUS** CABANIS.SUBGENUS **TELMATODYTES** CABANIS.**168. Cistothorus palustris** (WILS.).**Long-billed Marsh Wren.**

A common summer resident from May 5 to September 25. It is to be found in nearly all the more extensive swamps, especially where the cat-tail flag (*Typha latifolia*) abounds. While it of course breeds regularly in this locality, no nests have been discovered, owing to the great difficulty of traversing at the proper season the swamps where it occurs.

It is in song throughout its sojourn here, but sings with much less frequency during the latter part of the summer.

FAMILY **CERTHIIDÆ**. CREEPERS.GENUS **CERTHIA** LINNÆUS.**169. Certhia familiaris americana** (BONAP.).**Brown Creeper.**

A tolerably common spring and fall transient and rare winter resident. During the winter it remains principally in the woods of the bottom-lands, but during the migrations it occurs also on the high ground. Its earliest fall appearance is October 2, and it has never been observed later in spring than May 1; seldom, in fact, after the middle of April.

No positive breeding record has been established, but an unoccupied nest, which in position and structure much resembled that of this species, was discovered on May 7, 1891. This nest was situated about twenty feet from the ground in a crevice behind the bark of a dead tree, in damp bottom-land woods along the Killbuck.

FAMILY **PARIDÆ**. NUTHATCHES AND TITS.SUBFAMILY **SITTINÆ**. NUTHATCHES.GENUS **SITTA** LINNÆUS.**170. Sitta carolinensis** LATH.**White-breasted Nuthatch.**

A permanent resident; common in summer, abundant in fall and winter. It is most numerous in woodland, though in winter it commonly is elsewhere encountered. During the summer it apparently is partial to the bottom-lands and to timbered ravines, but in the fall and winter it is equally if not more abundant in the upland woods, being then frequently associated with Tufted Titmice, Chickadees and Golden-crowned Kinglets.

All the nests which have fallen under the writer's observation have been situated in either natural cavities or the abandoned excavations of Woodpeckers,—in living trees, or trees only partially dead. The breeding season continues usually from about the middle of April until the middle of June, nests with eggs being most common during the first three weeks in May. The disturbance of a nest containing even eggs sometimes occasions on the part of the parent birds an exhibition of great concern, and they repeatedly approach almost within reach, making at intervals swift dashes toward the intruder.

The notes of the White-breasted Nuthatch are most frequently heard during the colder months of the year.

171. *Sitta canadensis* LINN.

Red-breasted Nuthatch.

A very rare transient visitor. The only record for this species is September 26 1890.

SUBFAMILY PARINÆ. TITMICE.

GENUS *PARUS* LINNÆUS.

SUBGENUS *LOPHOPHANES* KAUP.

172 *Parus bicolor* LINN.

Tufted Titmouse.

A permanent resident; abundant except in summer. It is equally numerous on the uplands and the lowlands.

On October 2, 1892, a Tufted Titmouse was observed industriously hammering away at something in the crotch of a low tree. This object eventually proved to be the half-punctured cocoon of a large moth (*Tecla polyphemus*).

The Tufted Titmouse sings more or less continuously all the year, being least frequently heard during December and January. The duration of its maximum song seems to be from about the first of March until some time in June, after which period it sings much less regularly.

SUBGENUS *PARUS* LINNÆUS.

173. *Parus atricapillus* LINN.

Chickadee.

Resident; abundant in winter, but considerably less numerous in summer. During the latter season it is found most frequently in the woods of the bottomlands, though is by no means entirely confined to them; while in winter it occurs almost everywhere, at only this season regularly visiting the yards along the streets of the towns.

The nesting season begins about the middle of April, full complements of eggs being most common from the first to the fifteenth of May. A second brood is sometimes reared in June. Rather open bottom woodlands, where decaying stumps

abound, seem to be the favorite localities for breeding purposes. The nests situated in these low stumps are rarely over two feet from the ground, and considerable danger threatens from the spring flooding of the bottom-lands and the consequent uninhabitable condition of the nests when the water rises high enough to enter. A nest found by Mr. W. E. Henderson, June 24, 1892, was situated in a cavity in one of the supports of an old rail fence.

FAMILY SYLVIIDÆ. WARBLERS, KINGLETS, GNATCATCHERS.

SUBFAMILY REGULINÆ. KINGLETS.

GENUS **REGULUS** CUVIER.



GOLDEN-CROWNED KINGLET, SOMEWHAT REDUCED.

174. **Regulus satrapa** LIGHT.

Golden-crowned Kinglet.

Abundant in fall and spring; tolerably common as a winter resident. During the last mentioned season it remains chiefly in the shelter of ornamental evergreens, and in the most sheltered portions of the woods, but throughout the migrations it is found nearly everywhere.

It appears in fall with considerable regularity about the first of October, the extreme dates being September 27 and October 3. It departs about the end of the third week in April, but has once been observed to linger until May 1 (1892). It moves often in small scattered companies of usually not more than fifteen individuals; sometimes, though not ordinarily, associating with other birds.

175. **Regulus calendula** (LINN.).

Ruby-crowned Kinglet.

A transient visitor; abundant in the spring, but generally not so numerous in autumn. It has been noted from April 5 to May 15, and from September 23 to Octo-

ber 20. It is found principally in woodlands and thickets, both on the uplands and the bottoms, not being so frequently as the preceding species observed along the streets of the towns.

This species is, of course, regularly in song during the season of its occurrence in spring, and has been heard singing in October fully as well as during the vernal migration.

SUBFAMILY POLIOPTILINÆ. GNATCATCHERS.

GENUS *POLIOPTILA* SCLATER.

176. *Poliophtila cœrulea* (LINN.).

Blue-gray Gnatcatcher.

A common summer resident. It arrives ordinarily during the latter part of April, the nineteenth of this month being the earliest date recorded. It has not been observed later than August 3, yet it probably does not leave until September.

Throughout the breeding season it affects chiefly the upland woods and the timbered ravines adjacent. Nest-building begins about the middle of May, or even somewhat earlier, and by the middle of June nearly all the nests contain young. Apparently no second brood is regularly reared, but should the first nest be destroyed, another is commonly constructed.

The measurements of two nests are as appended :

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	2.65	1.70	1.85 x 1.20	1.80 x 1.60	2.25 x 2.10	2.75 x 2.35	2.85 x 2.00	0.75 x 0.25
2.....	2.50	1.60	1.85 x 1.25	1.65 x 1.50	2.05 x 1.90	2.60 x 2.25	2.25 x 1.85	0.50 x 0.25

The well-known scolding note of this species is most conspicuous from April to about the middle of July, being subsequently comparatively seldom heard. The real song of the Blue-gray Gnatcatcher has, in this locality, been detected upon only a single occasion,—August 3, 1890. It is a simple but pleasing ditty, in quality rather suggestive of the songs of some Warblers. It consists of one or two introductory notes, followed by a short warble; and the whole may be represented, very imperfectly of course, by the syllables *zet-ù, zet-ù, kset-kset-kset-kset*.

FAMILY TURDIDÆ. THRUSHES, SOLITAIRES, BLUEBIRDS, ETC.

SUBFAMILY TURDINÆ. THRUSHES.

GENUS *TURDUS* LINNÆUS.

SUBGENUS *HYLOCICHLA* BAIRD.

177. *Turdus mustelinus* GMEL.

Wood Thrush.

An abundant summer resident from April 21 to September 27. It may, in general, be regarded as a somewhat more numerous inhabitant of the woods on the bottoms

than of those on the uplands, although it is found in almost all suitable localities. It is particularly numerous in the woods along portions of Killbuck Creek.

The breeding season continues from about the end of the first week in May until the middle of July, but is at its height during the last two weeks of May and the first week in June. The favorite nesting places are wooded ravines and the timbered banks bordering the bottom-lands. Nearly all the nests found have been in saplings or bushes, usually from three to five, never higher than ten, feet from the ground.

The measurements of two nests are as follows:

No.	Height.	Depth.	Inside top diameter.	Inside middle diameter.	Outside top diameter.	Outside middle diameter.	Outside bottom diameter.	Width of rim.
1.....	3.50	1.63	3.13 x 3.00	2.75 x 2.75	4.50 x 4.00	5.50 x 5.25	4.00 x 3.50	0.63 x 0.33
2.....	4.00	2.25	3.00 x 3.00	3.00 x 3.00	4.50 x 4.25	5.25 x 5.00	6.00 x 4.50	1.00 x 0.50

This species is commonly imposed upon by the Cowbird, sometimes to the extent of two or even three eggs. A nest discovered June 28, 1891, contained three eggs of the Wood Thrush and three of the Cowbird. The former, with two of the latter, were perfectly fresh, while the third Cowbird's egg, besides being badly cracked and addled, was buried nearly out of sight among the materials composing the bottom of the nest. These circumstances seem clearly to indicate that this Cowbird's egg had been deposited several days in advance of the other eggs, and while the nest was in process of construction.

The Wood Thrush is in full song from the time of its arrival until the middle of June; subsequently continuing, but with less regularity, up to about the middle of July.

178. *Turdus fuscescens* STEPH.

Wilson's Thrush.

This species is apparently the least numerous of all the transient Thrushes. It has been observed only in 1892, when on May 1, 15, and 22, it was seen near Wooster, in woodland in the valley of the Killbuck. In the collection of Mr. E. N. Freeman, of Orrville, is a single specimen, which was taken in spring near that place.

179. *Turdus aliciae* BAIRD.

Gray-cheeked Thrush.

A tolerably common spring and fall transient, yet owing to the character of the localities frequented, and to its shy, retiring habits, is somewhat liable to be overlooked. It has been noted from May 8 to May 14, and from September 18 to October 2; principally in thickets along streams and the borders of woods, and in the timbered ravines adjoining the lowlands.

The stomach of a specimen shot on September 18, 1892, was filled with berries of the poke-weed (*Phytolacca decandra*), on which the bird was feeding when killed.

180. *Turdus ustulatus swainsonii* (CAB.).**Olive-backed Thrush.**

A tolerably common transient visitor from October 3 to 12, but not observed in the spring. It has been noted principally in timbered ravines, and on the wooded banks bordering the bottom-lands.

181. *Turdus aonalaschkæ pallasii* (CAB.).**Hermit Thrush.**

The most common species of the four transient Thrushes. It has been observed in spring from April 9 to May 11, and in fall from October 15 to October 20. It frequents chiefly the forests areas of the bottoms, and the woods along the upland streams, though is occasionally seen on the outskirts of the towns. It is apparently not in song during its migration through this region.

GENUS *MERULA* LEACH.**182. *Merula migratoria* (LINN.).****American Robin.**

An abundant summer resident. A few sometimes remain over winter. Its arrivals in spring have been from February 5 to 27, according to the severity of the season, but it is usually present before the middle of this month. It generally disappears by the first of November, and occasionally even earlier.

Nest-building is begun commonly about the first of April, and young with short tails, but able to fly, may be seen by the fifteenth of the following month. The breeding season appears to be at its height during May and the latter part of April, and to be practically ended by the first of July, since no occupied nests have been found later than June 26.

This species constructs its nest in all sorts of situations: not infrequently on a fence-post close to the railroad track, or even on the cross-bar of a telegraph pole. A nest discovered April 20, 1890, was on the top of one of the posts supporting an old shed; another, found on April 13 of the same year, was placed on the projecting end of one of the horizontal beams of a carriage bridge over a small stream. A nest was observed May 4, 1890, on one of the iron girders of a railroad bridge near Wooster. It was scarcely three feet below the rails, and directly beneath one of them. When found it contained three eggs, which in due time were hatched, and the young probably (though this was not positively determined) reared in safety. A nest noted May 18, 1890, was situated on the bank of a creek, in a small bush which overhung the water. It was built upon another Robin's nest, evidently an old one, for the new material of the superstructure was in marked contrast to the weatherbeaten appearance of the foundation.

Of sixty-two nests examined, thirty-seven were less than ten feet from the ground; twelve were between ten and fifteen feet; eight between fifteen and twenty; three between twenty and twenty-five; and one each at altitudes of twenty-five and thirty feet.

Robins in a condition of partial albinism seem not to be very uncommon. One in the writer's collection was taken March 9, 1892, and another was secured on March 27 of the same year; but these have, however, only a small proportion of white feathers.

The Robin has been ascertained to feed upon the fruits of the following plants and trees, the three first mentioned, at the season of their abundance, entering regularly and largely into its diet: elder (*Sambucus Canadensis*), poke-weed (*Phytolacca dacandra*), dogwood (*Cornus florida*), laurel oak (*Quercus imbricaria*), basswood (*Tilia Americana*).

During the course of the writer's investigations in the County, two Robin roosts were discovered. One of these was in a thick, bushy swamp along the Pittsburg, Fort Wayne and Chicago R. R. track, about two miles southwest of Wooster; but was seldom observed to be occupied. The other roost was situated in the northern portion of the city of Wooster, where, along parts of two streets, the birds made use of the thick foliaged maple trees. This roost, like the first, was the rendezvous for a comparatively small number of birds, which resorted thither more or less irregularly from 1891 to 1893, inclusive. It was first discovered in 1891, when on April 12, between six and seven o'clock in the afternoon, 494 birds were counted as they flew in from the southern part of the city. This was, of course, the census from only one direction, circumstances preventing more extended observations. Although no birds were seen to enter the roost again that year, some may very probably have been present. During the next year the Robins were noted at the roost on but a single occasion,—a few being seen July 17.

In 1893, however, the roost was used with apparently considerable regularity, both in the spring and after the close of the breeding season. Although similar gatherings in both summer and winter are, of course, well known to take place, the fact that the Robin resorts to roosts in the spring, before, and even for a while during the breeding season, is alluded to by neither Mr. Brewster,¹ Mr. Torrey² nor Mr. Widmann.³ Mr. Brewster states that none were seen at the roosts earlier than June 11, and is inclined to consider this exceptionally early. Small numbers of birds were, however, seen to enter this Wooster roost every few days from March 27 to May 15, after which date none were noticed until August 8. From August 8 to August 31, the flight was almost nightly observed, the number recorded gradually increasing, reaching its maximum towards the latter part of the month.

Throughout this period the largest number seen on any one evening was 265, but since the count was made from a single point, this number probably represents only a fraction of the total number of birds which daily resorted to the roost. None were noted on any occasion earlier than 6.36 P. M., and by 7.15 all had passed; the bulk being seen usually between 6.50 and 7.05 P. M. The time utilized by the birds was thus between sunset and dusk. In passing over the city most of the earlier comers flew quite high, only descending as the roost was neared; but a little later the flight was lowered so as barely to clear the house-tops; while the last flew close to the ground, passing chiefly through openings between the buildings.

The Robin commences to sing within a few days after its arrival, and continues in full song until late in June. Through July it sings regularly, though less frequently, and subsequently is heard more or less intermittently until towards the last of August. Then it is usually silent till late in September, when for a brief period its song is again resumed. The latest record of song is October 19 (1892). The following data indicate the time at which on several days the first note of the Robin was heard:—

May 8 (1891) at 4.03 A. M.;
 May 22 (1890) at 3.55 A. M.;
 May 27 (1890) at 3.25 A. M.;
 July 28 (1892) at 4.00 A. M.

¹ Auk VII, 1890, pp. 360 *et seq.*

² The Footpath Way, 1893, pp. 153 *et seq.*

³ Auk XII, 1895, pp. 1 *et seq.*

GENUS **SIALIA** SWAINSON.**183. Sialia sialis (LINN.).****Bluebird.**

Abundant; usually a permanent resident, though less numerous in winter, but if this season be especially severe, is probably altogether absent. Those individuals of the species which migrate south for the winter apparently return in February.

The breeding season extends from the middle of April to about the first of August, two or three broods being reared. A nest found May 25, 1890, in a small decaying stump, contained well fledged young and one addled egg. The entrance to this nest was only one foot above the ground.

The Bluebird sings regularly from about the middle of February until late in June, but much less frequently thereafter. It may at intervals, however, be heard till October, the latest recorded date of song being October 21 (1872).

HYPOTHETICAL LIST.

The following list is intended to comprise such birds as seem of probable occurrence in the region at present under consideration. Future investigations will doubtless establish Wayne County records for many of the species thus catalogued.

ORDER PYGOPODES.

FAMILY PODICIPIDÆ.

1. *Ocolymbus holboëllii* (REINH.).

Holboëll's Grebe.

Given by Wheaton, in his Report on the Birds of Ohio,¹ as a rare transient. It has been taken both on Lake Erie and on the waters of the interior of the State.

FAMILY URINATORIDÆ.

2. *Urinator lumme* (GUNN.).

Red-throated Loon.

A rare transient in Ohio.

ORDER LONGIPENNES.

FAMILY LARIDÆ.

3. *Larus delawarensis* ORD.

Ring-billed Gull.

In Ohio, especially on Lake Erie, a tolerably common species during the migrations.

¹ Geological Survey of Ohio IV, 1882, p. 566.

4. *Sterna forsteri* NUTT.**Forster's Tern.**

A transient visitor; of more or less frequent, though irregular, occurrence in the interior of the State.

5. *Sterna hirundo* LINN.**Common Tern.**

Common as a transient; apparently not a regular summer resident in the State, except on the Lake shore.

6. *Hydrochelidon nigra surinamensis* (GMEL.).**Black Tern.**

Wheaton records this species as a common summer resident in northern Ohio, and as a common transient elsewhere in the State.

ORDER STEGANOPODES.**FAMILY PHALACROCORACIDÆ.****7. *Phalacrocorax dilophus* (SWAINS.).****Double-crested Cormorant.**

A tolerably common transient in Ohio.

ORDER ANSERES.**FAMILY ANATIDÆ.****8. *Anas strepera* LINN.****Gadwall.**

A tolerably common transient visitor; probably also a summer resident in at least portions of the State.

9. *Aythya marila nearctica* STEJN.**American Scaup Duck.**

Transient visitor in Ohio; apparently not abundant.

10. *Aythya collaris* (DONOV.).**Ring-necked Duck.**

According to Wheaton, this species occurs abundantly as a transient in the State.

11. *Oidemia americana* SW. & RICH.**American Scoter.**

Occurs as an occasional winter visitor in the State.

12. *Oidemia deglandi* BONAP.**White-winged Scoter.**

This species has been taken both on Lake Erie and in the interior of the State.

13. *Oen hyperborea* (PALL.).**Lesser Snow Goose.**

Probably occurs, at least sparingly, with the next species.

14. *Oen hyperborea nivalis* (FORST.).**Greater Snow Goose.**

Mentioned by Wheaton as a rather irregular transient in Ohio, apparently more common on the Lake shore than elsewhere in the State.

15. *Anser albifrons gambeli* (HARTL.).**American White-fronted Goose.**

A transient visitor; occurring more or less frequently throughout the State.

16. *Branta canadensis hutchinsii* (RICH.).**Hutchins' Goose.**

Wheaton gives it as a rare transient; but a critical examination of the wild Geese killed in Ohio may possibly determine this subspecies to be of more frequent appearance than it has heretofore been considered.

17. *Olor buccinator* (RICH.).**Trumpeter Swan.**

Has been several times taken in Ohio; and some of the Swans which have from time to time been seen in Wayne County may have been of this species.

ORDER HERODIONES.

FAMILY ARDEIDÆ.

18. *Ardea candidissima* GMEL.

Snowy Heron.

Although not of common occurrence, specimens have been taken in northern Ohio.

19. *Nycticorax nycticorax nævius* (BODD.).

Black-crowned Night Heron.

Wheaton mentions this species as probably breeding in suitable places throughout the State.

ORDER PALUDICOLÆ.

FAMILY GRUIDÆ.

20. *Grus americana* (LINN.).

Whooping Crane.

A rare and probably an irregular transient in the State.

21. *Grus canadensis* (LINN.).

Little Brown Crane.

A rare transient visitor in Ohio.

FAMILY RALLIDÆ.

Porzana noveboracensis (GMEL.).

Yellow Rail.

A transient visitor; possibly a summer resident, though apparently not very common in the State.

ORDER LIMICOLÆ.

FAMILY PHALAROPODIDÆ.

23. Phalaropus lobatus (LINN.).

Northern Phalarope.

A transient visitor in Ohio; but seems to be not very common.

24. Steganopus tricolor VIEILL.¹

Wilson's Phalarope.

Like the last, a somewhat uncommon and irregular transient on the streams and lakes of the State. Wheaton mentions its possible summer residence in northwestern Ohio.

FAMILY RECURVIROSTRIDÆ.

25. Himantopus mexicanus (MÜLL.).

Black-necked Stilt.

This is a rare species in Ohio, but specimens have been several times taken in the northern part of the State.

FAMILY SCOLOPACIDÆ.

26. Macrorhamphus griseus (GMEL.).

Dowitcher.

A rare transient in the State.

27. Tringa canutus LINN.

Knot.

Transient visitor; perhaps not uncommon on the larger bodies of water.

28. Tringa fuscicollis VIEILL.

White-rumped Sandpiper.

Transient visitor; apparently more frequently found on the Lake shore than elsewhere in the State.

¹ *Phalaropus tricolor* of the A. O. U. Check-List; but the claims of *Steganopus* to full generic rank seem to be perfectly valid. (Cf ELLIOT, North American Shore Birds, 1895, p. 222.)

29. *Tringa bairdii* (COUES).**Baird's Sandpiper.**

A spring and fall transient; probably not rare in suitable localities in at least portions of the State.

30. *Tringa minutilla* VIEILL.**Least Sandpiper.**

A common transient, probably throughout the State. It is possibly a rare summer resident on Lake Erie.

31. *Tringa alpina pacifica* (COUES).**Red-backed Sandpiper.**

A common transient; perhaps more numerous on Lake Erie than in the interior of the State.

32. *Ereunetes pusillus* (LINN.).**Semipalmated Sandpiper.**

An abundant transient visitor in Ohio.

33. *Calidris arenaria* (LINN.).**Sanderling.**

A common transient visitor in the State, though apparently most numerous on the shore of Lake Erie.

34. *Limosa fedoa* (LINN.).**Marbled Godwit.**

A transient visitor; probably not uncommon in some portions of the State.

35. *Limosa hæmastica* (LINN.).**Hudsonian Godwit.**

Of less frequent occurrence in Ohio than the preceding species, but has been taken on Lake Erie and also in the interior.

36. *Symphemia semipalmata* (GMEL.).**Willet.**

A transient visitor; possibly a summer resident on the shore of Lake Erie. It appears to be not very common throughout the greater portion of Ohio.

37. *Numenius longirostris* WILS.**Long-billed Curlew.**

A transient visitor; in northwestern Ohio possibly an occasional summer resident.

38. *Numenius hudsonicus* LATH.**Hudsonian Curlew.**

A transient visitor; rare in the State.

39. *Numenius borealis* (FORST.).**Eskimo Curlew.**

A transient visitor; seemingly of rare occurrence in Ohio.

FAMILY CHARADRIIDÆ.**40. *Charadrius squatarola* (LINN.).****Black-bellied Plover.**

Apparently not a common species, but occurring sometimes in the interior of the State.

41. *Charadrius dominicus* MÜLL.**American Golden Plover.**

An abundant transient in Ohio, being found during migration in large numbers in suitable localities.

42. *Ægialitis semipalmata* BONAP.**Semipalmated Plover.**

Common transient visitor; according to Wheaton, most numerous in the fall.

43. *Ægialitis meloda circumcincta* RIDGW.**Belted Piping Plover.**

A summer resident probably only on Lake Erie; a tolerably common transient elsewhere in the State. This, the Mississippi Valley form, seems more likely to occur here than *Ægialitis meloda* from the Atlantic Coast; but no Ohio specimens have been examined.

FAMILY APHRIZIDÆ.

44. *Arenaria interpres* (LINN.).

Turnstone.

A transient visitor; apparently not common in the State.

ORDER RAPTORES.

FAMILY FALCONIDÆ.

45. *Accipiter atricapillus* (WILS.).

American Goshawk.

Of occasional occurrence as a winter visitor in Ohio.

FAMILY BUBONIDÆ.

46. *Surnia ulula caparoch* (MÜLL.).

American Hawk Owl.

A rare winter visitor in the State.

ORDER PASSERES.

FAMILY TYRANNIDÆ.

47. *Contopus borealis* (SWAINS.).

Olive-sided Flycatcher.

A rare transient visitor in Ohio.

FAMILY CORVIDÆ.

48. *Corvus corax principalis* RIDGW.

Northern Raven.

A rare winter visitor in Ohio, chiefly in the northern portion. Although no Ohio specimens of the Raven have been accessible, it seems probable that the form occurring in the State is as above given.

FAMILY FRINGILLIDÆ.

49. *Ooccothraustes vespertinus* (COOP.).**Evening Grosbeak.**

Although there appear to be but five published records of the occurrence of this species in Ohio, it is, during a winter favorable to its wanderings, liable to be found in almost any part of the northern half of the State.

50. *Pinicola enucleator canadensis* (CAB.).**American Pine Grosbeak.**

An irregular winter visitor, chiefly to northern Ohio. The American form, as here distinguished, though not admitted to the A. O. U. Check-List, is recognized by Mr. Ridgway, and is apparently tenable as a subspecies.

51. *Loxia curvirostra minor* (BREHM).**American Crossbill.**

An irregular winter visitor, though sometimes numerous even in the southern part of the State.

52. *Loxia leucoptera* GMEL.**White-winged Crossbill.**

Winter visitor; in Ohio, of much less frequent occurrence than the preceding species.

53. *Spinus pinus* (WILS.).**Pine Siskin.**

Wheaton mentions this species as an abundant winter visitor, and as possibly breeding in northern Ohio.

54. *Calcarius lapponicus* (LINN.).**Lapland Longspur.**

A common and moderately regular winter visitor in at least the northern half of the State.

55. *Ammodramus henslowii* (AUD.).**Henslow's Sparrow.**

Recorded by Mr. Lynds Jones¹ as a summer resident at Oberlin, Ohio, where it "was found to be not uncommon during the summer of 1894". Aside from the statement of Audubon², this seems to be the only reliable record of the occurrence of the species in the State. Its appearance in other suitable localities may, however, with reasonable confidence be anticipated.

¹ Auk XII, 1895, p. 241; Bulletin of Wilson Ornithological Chapter, No. 6, January 30, 1896, p. 2.

² Birds of America III, 1841, p. 76.

56. *Chondestes grammacus* (SAY).**Lark Sparrow.**

Rare summer resident in northern Ohio; apparently more common towards the middle of the State.

57. *Melospiza lincolni* (AUD.).**Lincoln's Sparrow.**

A tolerably common transient visitor in Ohio.

FAMILY TANAGRIDÆ.**58. *Piranga rubra* (LINN.).****Summer Tanager.**

A common summer resident in the southern part of the State, but apparently rare in northern Ohio.

FAMILY HIRUNDINIDÆ.**59. *Olivicola riparia* (LINN.).****Bank Swallow.**

Summer resident in some parts of Ohio, but appears to be only transient in others.

FAMILY AMPELIDÆ.**60. *Ampelis garrulus* LINN.****Bohemian Waxwing.**

A winter visitor to northern Ohio.

FAMILY VIREONIDÆ.**61. *Vireo philadelphicus* (CASS.).****Philadelphia Vireo.**

A transient visitor; probably not rare in the State.

62. *Vireo solitarius* (WILS.).**Blue-headed Vireo.**

A transient visitor; apparently not breeding in Ohio.

63. *Vireo noveboracensis* (GMEL.).**White-eyed Vireo.**

A summer resident in Ohio; probably more common in the southern portion of the State.

FAMILY MINIOTILTIDÆ.**64. *Helmitherus vermivorus* (GMEL.).****Worm-eating Warbler.**

A summer resident in the more southern parts of the State. It probably occurs also in northern Ohio.

65. *Helminthophila chrysop'era* (LINN.).**Golden-winged Warbler.**

A summer resident; apparently not common in Ohio.

66. *Helminthophila rubricapilla* (WILS.).¹**Nashville Warbler.**

A common transient visitor in at least portions of the State.

67. *Helminthophila celata* (SAY).**Orange-crowned Warbler.**

An occasional transient visitor in the State.

68. *Compsothlypis americana usneæ* BREWSTER.**Northern Parula Warbler.**

A transient visitor throughout much of the State, though probably breeding in suitable localities. This species has been on one or two occasions partially identified in Wayne County, but no specimens have been secured.

69. *Dendroica dominica albilora* RIDGW.**Sycamore Warbler.**

A summer resident, at least formerly, even in northern Ohio, though probably local in its distribution.

¹ Cf. FAXON, Auk XIII, 1896, p. 263.

70. *Dendroica kirtlandi* BAIRD.**Kirtland's Warbler.**

The possibility that Kirtland's Warbler may yet be taken in Wayne County is suggested by the proximity of the type locality of the species, together with the probability that the valleys of the tributaries of the Muskingum River form the highway of migration for many of the birds which breed about Cleveland, or which occur there during the spring season.

71. *Dendroica vigorsii* (AUD.).**Pine Warbler.**

A rare transient visitor in Ohio.

72. *Dendroica palmarum* (GMEL.).**Palm Warbler.**

A common transient visitor, though perhaps somewhat local in the State.

73. *Dendroica discolor* (VIEILL.).**Prairie Warbler.**

Given as a summer resident in northern Ohio, by Wheaton, who says that it is rare. A Warbler seen by the writer in May, 1891, was probably of this species, but the bird was unfortunately not secured.

74. *Seiurus noveboracensis* (GMEL.).**Water Thrush.**

A tolerably common transient visitor in the State.

75. *Geothlypis formosa* (WILS.).**Kentucky Warbler.**

A summer resident in Ohio, but rare and local. On April 23, 1893, an individual, undoubtedly of this species, was seen singing in the woods on the bottom-lands of the Killbuck, in Wayne County. As, however, the bird was not obtained, the circumstance is mentioned merely as a hypothetical record.

76. *Sylvania mitrata* (GMEL.).**Hooded Warbler.**

A rare summer resident in Ohio.

77. *Sylvania canadensis* (LINN.).**Canadian Warbler.**

A transient visitor; not uncommon in the State.

FAMILY MOTACILLIDÆ.

78. *Anthus pensilvanicus* (LATH.).

American Pipit.

A common transient visitor in Ohio.

FAMILY TROGLODYTIDÆ.

79. *Mimus polyglottos* (LINN.).

Mockingbird.

A summer resident; rare even in the southern part of the State, but has been reported breeding near Lake Erie.

80. *Thryothorus bewickii* (AUD.).

Bewick's Wren.

A summer resident in southern Ohio.

81. *Oistothorus stellaris* (LICHT.).

Short-billed Marsh Wren.

A summer resident in the State, but apparently of local distribution. A careful investigation of the numerous swamps of Wayne County would possibly reveal the presence of this species.

FAMILY PARIDÆ.

82. *Parus carolinensis* AUD.

Carolina Chickadee.

A regular summer resident in Ohio, at least from the latitude of Columbus southward.

NOTE.

By reason of an unfortunate misunderstanding, the proof-sheets of pages 243-270 were not submitted to the author for revision. This oversight has resulted in the admission of a number of unpleasant inaccuracies of punctuation, particularly in the generic and subgeneric names; and furthermore has rendered necessary the insertion of the following list of

ERRATA.

- Page 245, 2nd line from bottom, for occasional read occasional.
Page 247, 3d line from top, for *Egialites* read *Egialitis*.
Page 247, 13th line from top, *Syrinum* read *Syrnium*.
Page 248, 13th line from bottom, for *valutina* read *velutina*.
Page 249, 14th line from top, for *saccharum* read *Saccharum*.
Page 249, 21st line from top, for prevalent read prevalent.
Page 250, 8th line from bottom, for Chilion read Chelidon.
Page 250, 9th line from bottom, for Progue read Progne.
Page 250, 16th line from bottom, for Spicella read Spizella.
Page 251, 1st line from top for Deudroica read Dendroica.
Page 251, 4th line from top, for pennsylvanica read pensylvanica.
Page 251, 27th line from top, for asia read asio.
Page 252, 21st line from top, for pennsylvanica read pensylvanica.
Page 252, 5th line from bottom, for Erismatur read Erismatura.
Page 252, 9th line from bottom, for valisneria read vallisneria.
Page 255, 6th line from top, for (LINN.) read LINN.
Page 255, 18th line from top, for CEPHI read CEPPI.
Page 255, 1st line from bottom, for park read part.
Page 256, 5th line from top, for (COUES) read COUES.
Page 256, 7th line from top, for Appearing read Appears.
Page 256, 8th line from bottom, for (GMEL.) read GMEL.
Page 256, footnote, for survey read Survey.
Page 256, footnote, for p. 42 read p. 542.
Page 257, 2nd line from bottom, for hough read though.
Page 258, 4th line from top, for (LINN.) read LINN.
Page 258, 5th line from bottom, for (GMEL.) read GMEL.
Page 258, 10th line from bottom, for Badpate read Baldpate.
Page 258, 11th line from bottom, for (GMEL.) read GMEL.
Page 258, 16 h line from bottom, for (GMEL.) read GMEL.
Page 259, 2nd line from top, for (LINN.) read LINN.
Page 261, footnote, for survey read Survey.
Page 263, 2nd line from top, for LINN. read LINNÆUS.
Page 263, 7th line from bottom, for (LINN.) read LINN.
Page 264, 5th line from top, for (GMEL.) read GMEL.
Page 264, 14th line from top, for (LINN) read LINN.
Page 264, 22nd line from top, for apprao h read approach.
Page 264, footnote 4, for i dicated read indicate.
Page 265, 6th line from top, for (AUD.) read AUD.
Page 265, 8th line from bottom, for (LINN) read LINN.
Page 267, 3rd line from top, for (GMEL.) read GMEL.
Page 267, 21st line from top, for were rea i was.
Page 268, 3rd line from top, for (VIEILL) read VIEILL.
Page 268, 12th line from bottom, for occuring read occurring.
Page 269, 14th line from top for fieldst read fields.
Page 269 4th line from bottom, for shriveled read shrivelled.
Page 270, 4th line from bottom, for preferring read preferring.
Page 271, 10th line from top, for (LINN.) read LINN.
Page 279, 9th line from top, for (LINN.) read LINN.
Page 279, 18th line from top, for (LINN.) read LINN.
Page 280, 4th line from top, for (BONAP.) read BONAP.

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